Ann. Natal Mus. Vol. 38 Pages 21–53 Pietermaritzburg November, 1997

The South African species of *Afrocamilla* Barraclough, 1992 (Diptera: Schizophora), a genus of Camillidae associated with rock hyrax latrines

by

D. A. Barraclough
(Natal Museum, P. Bag 9070, Pietermaritzburg 3200, South Africa)

ABSTRACT

The South African species of *Afrocamilla* Barraclough, 1992, are revised on material collected and accumulated since 1990. At least seven species are recorded, and the identity of two additional putative species is left unresolved. Five new species are described: *artopenna* (KwaZulu-Natal); *carolae* (Eastern Cape); *confusa* (KwaZulu-Natal, Eastern Cape); *elongata* (KwaZulu-Natal, Eastern Cape); and *sineseta* (Northern Province, Mpumalanga, KwaZulu-Natal). *A. armata* (Hackman, 1960) is newly recorded from the Free State, KwaZulu-Natal, Eastern Cape, Western Cape and probably the Northern Cape; difficulties with marked intraspecific variation are discussed. *A. stuckenbergi* Barraclough, 1992, is newly recorded from the Eastern Cape. Both *armata* and *stuckenbergi* are redescribed. An illustrated key to the seven named species is presented. The biology and ecology of the South African fauna is discussed, particularly its association with excrement of the rock hyrax *Procavia capensis* (Pallas). All species except *artopenna* sp. n. and *sineseta* sp. n. have been collected from hyrax excrement and occur sympatrically with other species. Species relationships are briefly discussed, and the fauna is provisionally divided into four groups. One of these groups, the *armata*-complex, contains four closely related species (*armata* (Hackman, 1960), *elongata* sp. n., *adusta* Barraclough, 1997 (Tanzania) and *stuckenbergi* Barraclough, 1992) which are reliably distinguished only by structures of the male terminalia. The male terminalia are illustrated and described for each species. The ventral receptacle and spermathecae of *stuckenbergi* are described, as are the ventral receptacles of *armata* and *elongata*. The unexpected size and radiation of the afrotropical fauna is briefly discussed.

INTRODUCTION

As recently as 1990, virtually nothing was known about the afrotropical camillid fauna, and the family was erroneously supposed to be predominantly palaearctic. In subsequent publications (Barraclough 1992 1993 1997; Barraclough & Wheeler 1995), I have shown that Camillidae occur in the southwestern Nearctic Region, and that the family seems to have radiated most strongly in the afrotropics, where all four extant genera occur (*Afrocamilla* Barraclough, 1992; *Camilla* Haliday, 1838; *Katacamilla* Papp, 1978; and *Teratocamilla* Barraclough, 1993). In contrast, only two genera each are recorded (or are likely to be recorded) from the Palaearctic Region and the New World. The current total of 20 African camillid species (including at least four undescribed species of *Camilla* and *Katacamilla*, and one of *Afrocamilla*), already clearly exceeds the total of 14 species known from the Palaearctic Region and the New World. I fully expect the afrotropical camillid fauna to reach 40–50 species, if comprehensive collecting is undertaken throughout the region.

It is not difficult to understand why the southern African fauna of Camillidae has remained virtually undetected for so long. The coprophagous habit of the family and

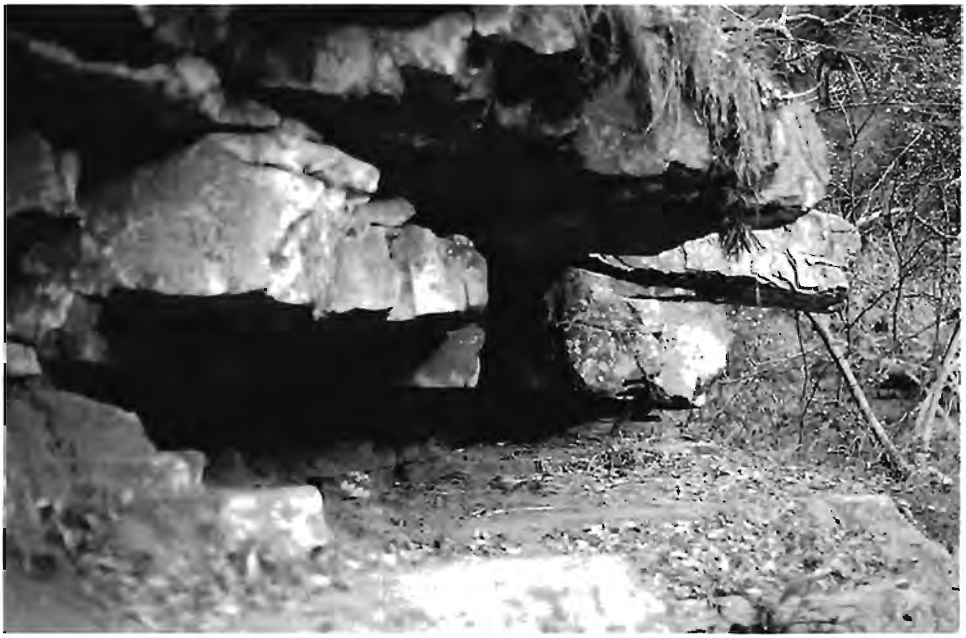


Fig. 1. Rocky outcrop forming a small shelter at base, typically favoured by hyraxes. *Afrocamilla stuckenbergi* Barraclough, 1992, and an undetermined species of *Camilla* were collected from hyrax excrement at such a locality at Krantzkloof Nature Reserve, KwaZulu-Natal. [Photograph: D. Barraclough.]

their affinity for the excrement of bats and particularly hyraxes, have ensured this, as well as the inaccessibility of the sites usually favoured by these small mammals. The rock hyrax *Procavia capensis* (Pallas) is by far the commonest species of hyrax in South Africa, and has a wide distribution, except in the far Northern Cape and the northeast of KwaZulu-Natal (Pringle 1975; Smithers 1983); the species is normally absent only from dense forest and non-rocky areas, being dependent on the existence of permanent abodes in cavities under or between rocks (Davies 1997). During the more than six years in which I have collected *Afrocamilla* from the excrement of *P. capensis*, rock hyrax colonies have been found in a wide variety of rocky areas, ranging from clifftops, to crevices and ravines at the base of precipices, small caves or rock shelters, beneath rocky outcrops (Fig. 1) and large boulders, on rocky hillsides (Fig. 2) or even in roadside rubble. Even though many colonies can easily be approached, their latrines (accumulated excrement and urine) are often out of reach in crevices or beneath boulders.

When latrines of *P. capensis* are accessible, they become remarkable resources for the study of coprophagous Diptera, as they are often well sheltered from the elements and are substantial in size (*P. capensis* lives socially with as many as 18 individuals living together (Davies 1997)). I have focussed on collecting *Afrocamilla* at such sites, but ironically this has meant that I may have overlooked *Camilla*, which towards the end of my study I realised was also likely to be widespread on hyrax excrement in South Africa (where it has been collected from three localities). Two species of *Meoneura* Rondani, 1856 (Carnidae), have also been collected from rock hyrax excrement in the Western Cape and KwaZulu-Natal (Barraclough 1994; Deeming 1997), indicating that this poorly known family may be much commoner in the afrotropics than previously supposed. Curtonotidae are another acalyptrate family which I have observed on hyrax excrement in KwaZulu-Natal; further study of this association may well contribute to our knowledge of the biology of these flies, about which little is known in the afrotropics (see e.g. Wirth & Tsacas 1980).

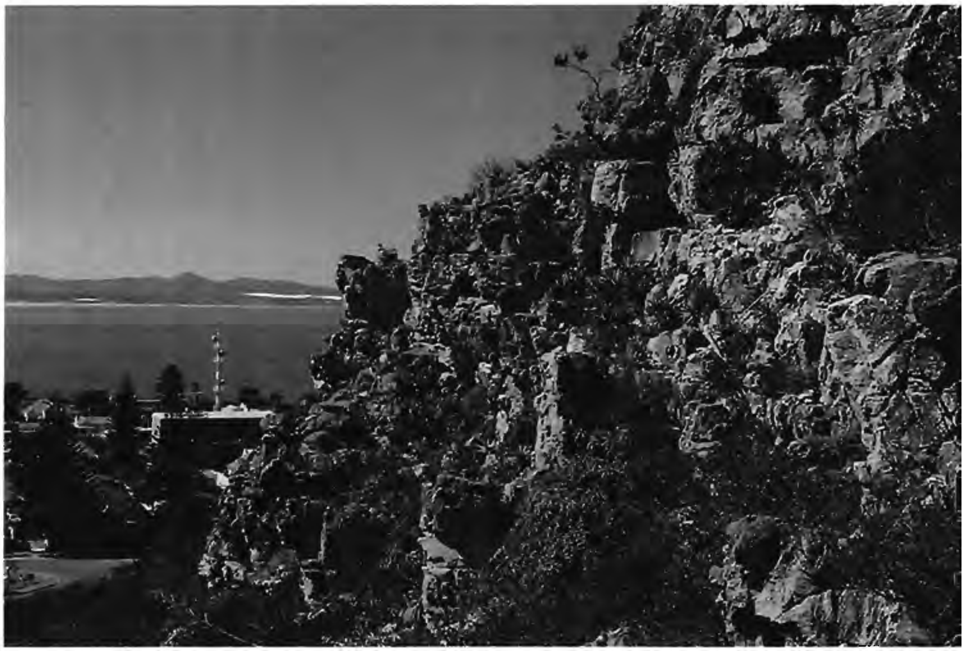


Fig. 2. Steep, rocky hillside with large boulders. Hoy's Hill, Hermanus, Western Cape. *Afrocamilla armata* (Hackman, 1960) was collected from hyrax excrement at this locality. [Photograph: J. Londt.]

In conclusion, it should be stressed that the distribution of *Afrocamilla* in South Africa is likely to mirror that of the rock hyrax; both may occur even in disturbed habitats. The known distribution of *Afrocamilla* in South Africa (Figs 39 & 40) probably merely reflects opportunistic collecting: some isolated localities where hyraxes have been in abundance, or where hyrax abodes have been investigated. KwaZulu-Natal is the only Province where a reasonable degree of sampling has occurred; there are no records from the North-West and Gauteng Provinces, and only one each from the Northern Province, Mpumalanga, Free State and Northern Cape. Many exciting possibilities for the collection of further material, and the expansion of our taxonomic knowledge of *Afrocamilla*, thus exist.

MATERIALS AND METHODS

The majority of material treated in this paper was collected by myself or my colleagues in South Africa. The most successful collecting technique used was to kneel adjacent to hyrax latrines, observe the flies at a distance of about 10 cm above the excrement, and then collect individuals or copulating pairs from the top of individual faecal pellets. This was best done by rapidly placing an inverted vial (1.0–1.5 cm diameter and 5.0–6.0 cm long) over the entire pellet, disturbing the captured fly or flies until they flew upwards, and then rapidly inverting the tube and inserting the stopper. Adult *Afrocamilla* are readily recognised on excrement by their red eyes, folded wings (which are regularly flexed up-and-down), and the typically metallic appearance of the thorax and abdomen (see Barraclough 1992: 47–48). I have had considerably less success using insect sweep-nets to capture material (swung briskly backwards and forwards over the excrement), mainly because latrines are often in crevices or surrounded by rocky outcrops, making this technique difficult to undertake.

Specimens examined in this paper are deposited in the following institutions: Natal Museum, Pietermaritzburg, South Africa (NMSA); Museum of Zoology and Entomology, Lund University, Sweden (MZLU). Most are dry, and double-mounted (using minuten pins) onto *Polyporus* or synthetic strips; a few alcohol-preserved specimens are deposited in the Natal Museum Diptera collection.

Holotype label data are cited verbatim, with supplementary information in brackets; a slash denotes the end of a line of print and a semicolon separates different labels.

Abdomens were detached at or near the base, macerated in hot KOH, and then rinsed; female material processed since late 1994 was sometimes macerated in warm 80–85 % lactic acid, as this better preserves internal postabdominal structures. Dissected genitalia were positioned in glycerine jelly for drawing. Terminalia and associated abdominal parts were stored in glycerine in a microvial pinned beneath each source specimen.

Morphological terminology mainly follows Barraclough (1992 1993 1997), and Barraclough & Wheeler (1995). Bilaterally symmetrical structures are described in the singular. Body length was measured from the anterior margin of the third antennal segment to the abdominal apex; two measurements were sometimes required to compensate for body curvature. Wing length was measured from the humeral crossvein to the wing tip. Measurements of holotypes are given (after the range for other specimens examined). Maximum frons width was measured at a position just behind the posterior ocelli. Measurements of holotypes are given in parentheses after the range for other specimens examined.

Illustrations were made using a camera lucida attached to a Wild M5 stereomicroscope (external features) and to a Zeiss compound microscope (for dissections of the male and female postabdomen). Ventral views of the male terminalia show only the epiphallus and distiphallus, postgonites, surstyli and hypandrium. Note that lateral displacement of the postgonites seems to be a consistent character state in some species (e.g. *A. elongata*, see Fig. 29).

Slide preparations of the ventral receptacle and spermathecae of *A. stuckenbergi* Barraclough, 1992, were prepared as follows: adult females were killed in a drop of hot water and immediately dissected; the organs were then transferred into a drop of polyvinyllactophenol with an admixture of Chlorazol Black E, and then slide-mounted.

SPECIES RELATIONSHIPS

No attempt has been made to undertake a cladistic analysis of species relationships. This would be premature given our fragmentary knowledge of

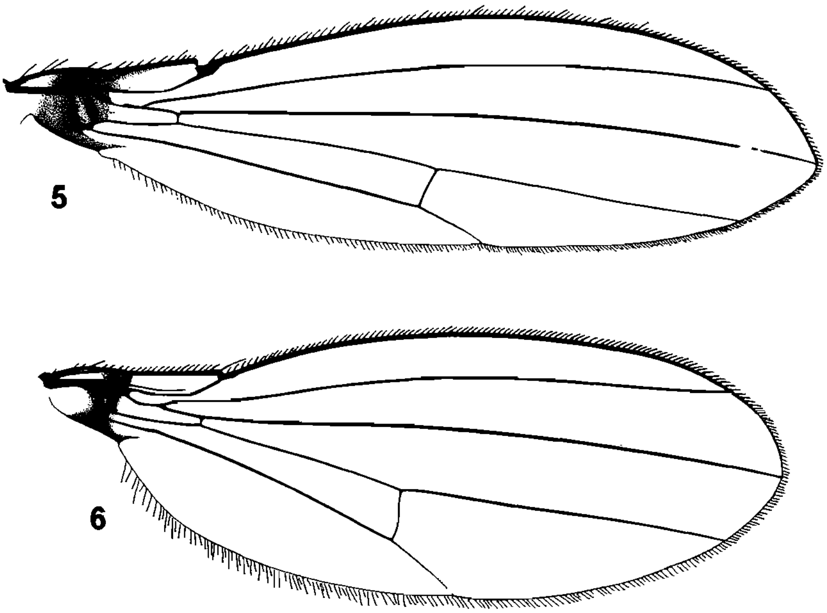
3

4

Figs 3 & 4. Rocky precipice, surrounded by *Podocarpus* forest, Mpofu Game Reserve, *ca.* 25 km N. Fort Beaufort, Eastern Cape. 3. Distant view of precipice, showing surrounding forest and grassland above. 4. Base of precipice, parts of which were frequented by hyraxes. *Afrocamilla armata* (Hackman, 1960), *A. carolae* sp. n., *A. confusa* sp. n., and *A. elongata* sp. n. were collected sympatrically from hyrax excrement at this site. [Photographs: J. Williamson.]

Afrocamilla in the afrotropics. Nevertheless, some comments about perceived relationships of the southern African species can be made. The seven named South African species can be divided into four groups. Both *A. artopenna* sp. n. and *A. confusa* sp. n. have no obvious relationships with other known species of *Afrocamilla*, and each is placed in its own disjunct group; the most striking diagnostic characters of each species are listed in the key to species (below). The third group of species contains *A. carolae* sp. n., *A. sineseta* sp. n. and Undescribed sp. B (as well as Undescribed sp. 1 from Kenya (see Barraclough 1997)). This group is well defined by the absence of the proclinate fronto-orbital bristle, although this bristle has been lost independently in *exculta* from Gambia (see Barraclough 1997).

The fourth group of species is here termed the *armata*-complex, and includes *A. armata* (Hackman, 1960), *A. elongata* sp. n., *A. stuckenbergi* Barraclough, 1992, as well as *A. adusta* Barraclough, 1997, from Tanzania. This group is defined by the following combination of character states: head with frons moderately short and broad, length at midline about two-thirds to three-quarters maximum width (e.g. Fig. 16); basal scutellar marginal bristles weakly developed, about half length and strength of apical marginals; wing not unusually narrow, transverse basal fascia present (e.g. Fig. 6); and head with proclinate fronto-orbital bristle present (e.g. Figs 7 & 11). Species within this complex can only be reliably distinguished by



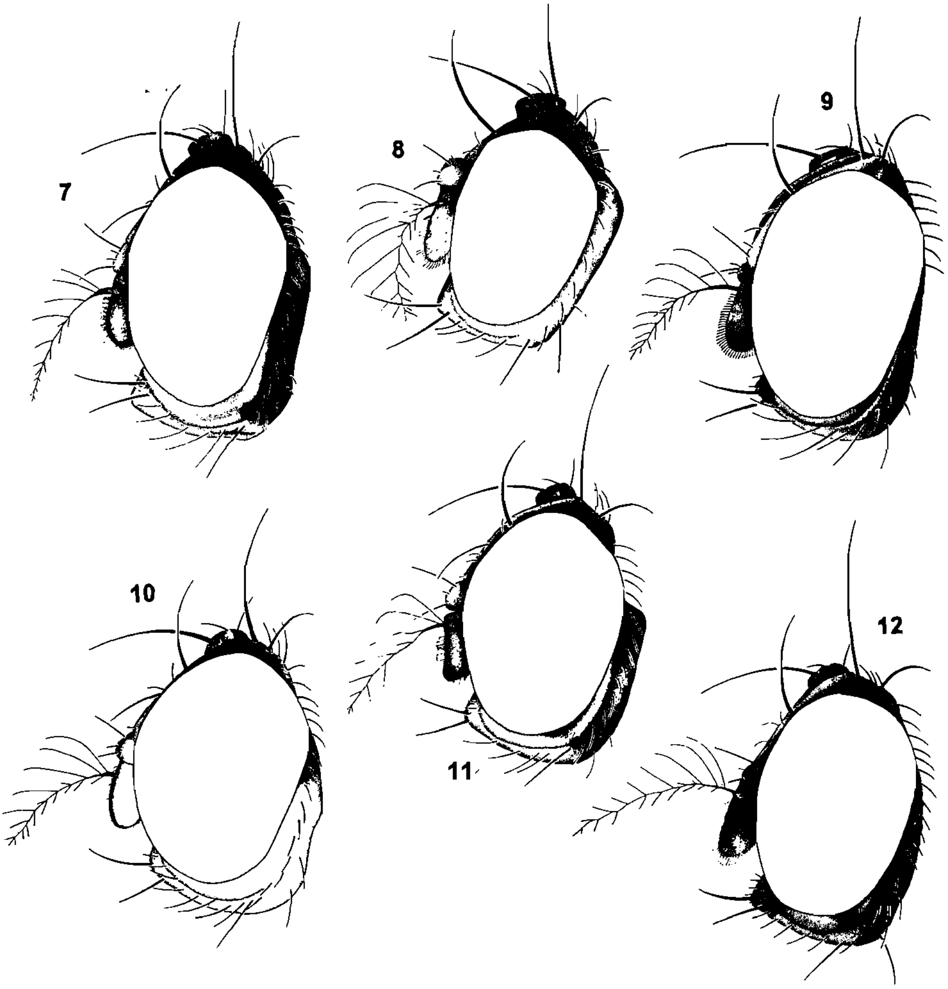
Figs 5 & 6. Wings of selected South African *Afrocamilla* species, showing shape and position of transverse basal fascia. 5. *A. artopenna* sp. n. 6. *A. stuckenbergi* Barraclough, 1992.

character states of the male terminalia, although it is usually possible to associate sympatric females using colour characters. Relationships within the complex remain unclear pending the discovery of additional species. The shape and structure of the ventral receptacle do not seem to differ between species of the complex, although differences occur between unrelated species of *Afrocamilla* in tropical Africa (see Barraclough 1997: Figs 20–22).

BIOLOGY AND DISTRIBUTION

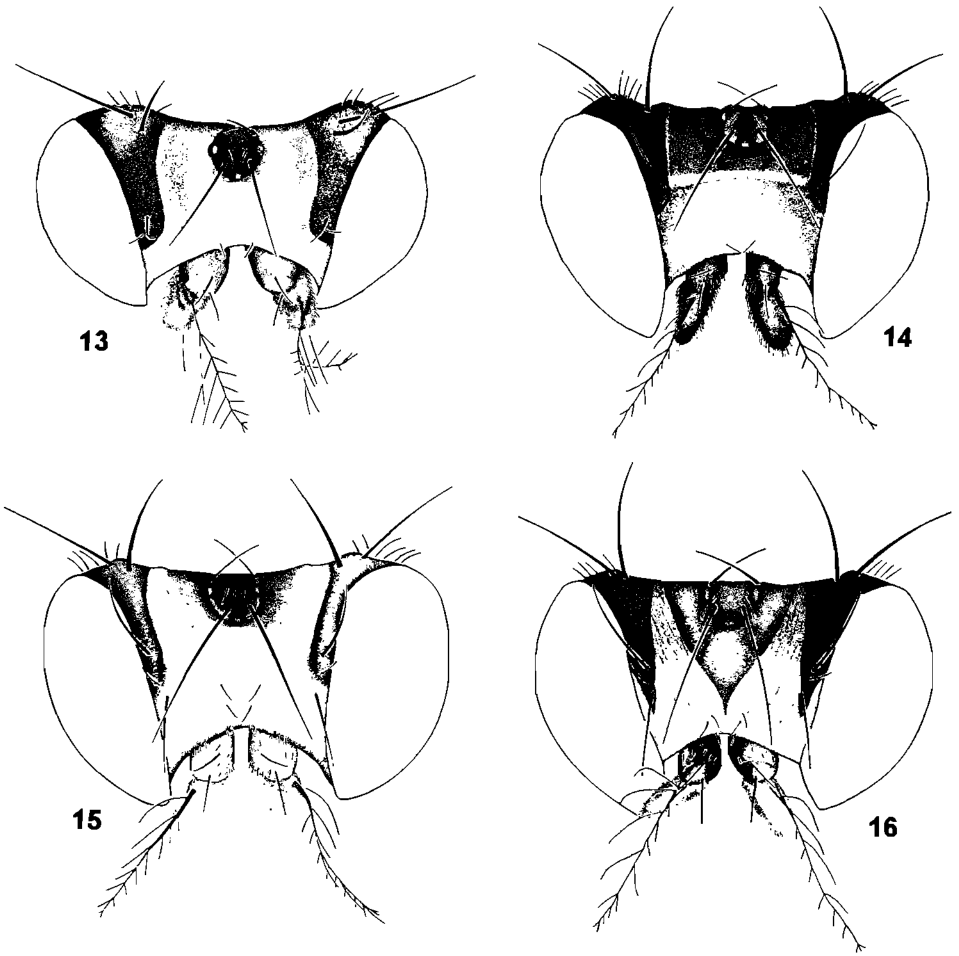
Based on available data, the southern African species of *Afrocamilla* are closely associated with the excrement of rock hyraxes, where the immature stages of most species almost certainly develop (see Barraclough 1992). However, there is growing evidence that *Afrocamilla* also utilises the excrement of other mammal species, including baboons, bats, and probably monkeys and birds (see Barraclough 1997). This is confirmed in South Africa, where *A. artopenna* sp. n. occurs outside the range of hyraxes in north-eastern KwaZulu-Natal (Pringle 1975; Smithers 1983), and *A. elongata* sp. n. has been collected from a suburban Pietermaritzburg locality where hyraxes do not occur. As most collecting was undertaken during the summer months, little can be said about phenology.

A surprising development during the later stages of my study was the discovery that several species of *Afrocamilla* can occur sympatrically at the same hyrax latrine.



Figs 7–12. Head profiles of selected South African *Afrocamilla* species, showing details of shape, coloration and all vestiture. 7. *A. armata* (Hackman, 1960) (5 km W. Clanwilliam). 8. *A. artopenna* sp. n. (Ndumu Reserve). [The reclinate fronto-orbital is detached, but has been drawn in based on the bristle from the right side of the frons]. 9. *A. sineseta* sp. n. (Entabeni Forest Station). 10. *A. confusa* sp. n. (Mpofu Game Reserve). 11. *A. elongata* sp. n. (Merrivale). [The outer vertical bristle is detached, but has been drawn in]. 12. *A. carolae* sp. n. (Mpofu Game Reserve).

This reaches its zenith at Mpofu Game Reserve, Eastern Cape, where four species were collected from hyrax excrement at the same site (Figs 3 & 4). All instances of sympatry are discussed in the 'Discussion' section of each species treatment. Also of interest is that *Camilla* species also occur sympatrically with *Afrocamilla* at certain localities, namely 5 km W. Clanwilliam (Western Cape), Klipkoppie (Northern Cape), and Krantzkloof Nature Reserve (KwaZulu-Natal). These observations are corroborated by evidence from Kenya and Tanzania (Barraclough 1997).



Figs 13–16. Heads in dorsal view, of selected South African *Afrocamilla* species, showing details of shape, structure of frons, coloration and all vestiture. 13. *A. artopenna* sp. n. (Ndumu Reserve). [The right reclinate fronto-orbital is detached, but has been drawn in]. 14. *A. carolae* sp. n. (Mpofu Game Reserve). 15. *A. confusa* sp. n. (Mpofu Game Reserve). 16. *A. elongata* sp. n. (Merrivale). [The right outer vertical bristle is detached, but has been drawn in].

TAXONOMY

Key to named South African species of *Afrocamilla*

1 Head with frons markedly short and broad (Fig. 13), length at midline only about half maximum width. Basal scutellar marginal bristles unusually well developed, slightly longer and stronger than apical marginals. Wing unusually narrow (Fig. 5). [Northern KwaZulu-Natal] .... **artopenna** sp. n.

– Head with frons moderately short and broad (e.g. Figs 14–16), length at midline about two-thirds to just more than three-quarters maximum width. Basal scutellar marginal bristles weakly developed, only about half length and strength of apical marginals. Wing not unusually narrow (e.g. Fig. 6) 2

2 Wing lacking basal transverse fascia. Male terminalia as in Figs 30 & 31, surstylus appearing unusually elongate and slender in profile, without dorso-basal projection and mostly parallel-sided along basal three-quarters. [KwaZulu-Natal, Eastern Cape] .... **confusa** sp. n.

– Wing always with basal transverse fascia (e.g. Fig. 6), although this sometimes inconspicuous when pale. Male terminalia (male of *A. carolae* unknown) with surstylus usually not elongate and slender in profile, if so then with dorso-basal projection (e.g. Fig. 26) and/or not mostly parallel-sided along basal three-quarters 3

3 Head without proclinate fronto-orbital bristle [careful examination required] (e.g. Figs 9 & 12) 4

– Head with proclinate fronto-orbital bristle (e.g. Figs 7, 10 & 11) 5

4 Cheek height in profile noticeably shallow, 0.2–0.3 X length of third antennal segment (Fig. 9). Anterior half of dark mesonotum with paler medial and lateral vittae. Male terminalia as in Fig. 32. [Northern Province, Mpumalanga, KwaZulu-Natal] .... **sineseta** sp. n.

– Cheek height in profile noticeably deeper, 0.5 X length of third antennal segment (Fig. 12). Anterior half of mesonotum entirely dark. [Eastern Cape] .... **carolae** sp. n.

5 Male terminalia: Epandrium strikingly robust and broad in profile, much deeper at posterior extremity, depth here nearly always 3.0–4.0 X that at anterior extremity, anterior extremity usually strongly narrowed (Fig. 33). Postgonite with characteristic triangular shape in profile (base usually obscured by surstylus), broad basally with relatively sharply pointed apex (Fig. 33). [KwaZulu- Natal] .... **stuckenbergi** Barraclough, 1992

– Male terminalia: Epandrium not robust and broad in profile, nor much deeper at posterior extremity (i.e. depth here noticeably less than 2.0 X that at anterior extremity) (e.g. Figs 19, 25, 28). Postgonite not with characteristic triangular shape in profile, either slender along much of length (Fig. 28), or broader and smoothly rounded apically (e.g. Fig 21) 6

6 Male terminalia: Epiphallus robust and broadly rounded apically in profile (e.g. Figs 17, 19 & 25). Postgonite stout in profile, broader at apex, here broadly and smoothly rounded (e.g. Figs 21, 23 & 25). [Free State, KwaZulu-Natal, Eastern Cape, Western Cape, probably Northern Cape] .... **armata** (Hackman, 1960)

– Male terminalia: Epiphallus slender and sharply pointed at apex in profile, here strongly upcurved (Fig. 28). Postgonite slender in profile, narrower apically, here relatively sharply pointed (Fig. 28). [KwaZulu-Natal, Eastern Cape] .... **elongata** sp. n.

Afrocamilla armata (Hackman, 1960)

Figs 7, 17–22, 23–27, 35, 39

Camilla armata Hackman, 1960: 381; Cogan, 1980: 654; Papp, 1985: 218.
Afrocamilla armata: Barraclough, 1992: 44; Barraclough, 1997: 184.

Holotype ♂ : SOUTH AFRICA: **Western Cape**: 'S Afr Cape Prov / Cape Peninsula, Hout / Bay Skoorsteenkop. / 2.II.51 No. 166'; 'Swedish South Africa / Expedition / 1950–1951 / Brinck – Rudebeck'; 'Insect trap / Alt ft'; '*Camilla / armata* / Hackm. / Holotypus' [Rectangular red card]; 'Holotypus' [Printed with black border]; 'Zool.Mus.Lund Sweden / Type No. 40:1 / Camillidae'. In MZLU. In poor condition, left wing apically tattered, frons and thoracic pleura partially rubbed and mesonotum badly torn by pin (abdomen dissected free, stored with cleared postabdomen in glycerine-filled microvial beneath specimen).

Redescription (based on both sexes of South African material):

Dimensions (in mm): Body length 2.4–3.1 (1.3); wing length 2.1–2.6 (*ca.* 2.2). Note that the abdomen of the holotype is dismembered (in glycerine) and the body length measurement is only to the apex of T2.

Colour/Pollinosity: Head colour variable, usually mostly medium to dark brown to black with most of cheek yellow-brown (sometimes partly so), sometimes second and third (partly to entirely) antennal segments and parafacial yellow to yellow-brown, facial region sometimes partly to almost entirely yellow-brown, and about anterior half to two-thirds of frons with ground colour yellow-brown (sometimes indistinct and evident at certain angles only or appearing entirely dark); lower half of occiput rarely yellow to yellow-brown; pollinosity silver to brown, mainly restricted to occiput. Thorax very variably coloured, ranging from almost entirely brown to very dark brown to black with paler (yellow-brown) humeral callus to predominantly pale in many specimens from northern KwaZulu-Natal (in these mesonotum darker medially and more so posteromedially, as well as darker posterodorsally on pleuron and on humeral callus/notopleural region); mesonotum sometimes with metallic blue reflections, often with variously developed yellow-brown paired medial and lateral vittae which are usually restricted to presutural region but sometimes extending to scutellum; humeral callus, propleuron and upper sternopleuron sometimes all yellow-brown; pollinosity dense and yellow to brown on scutellum, more difficult to discern but visible along posteroventral margin of sternopleuron (silver) and broadly from hypopleuron to scutellum (usually ranging from silver below to brown above). Legs variable in colour, mostly pale yellow to pale yellow-brown, but mid and hind femora usually with about apical one-fifth to two-thirds pale to dark brown, and sometimes basal two-fifths to half of respective tibiae also brown (pale to medium); some specimens with hind femur almost entirely pale, and rarely (many specimens from northern KwaZulu-Natal) legs almost entirely yellowish. Wing membrane virtually hyaline to pale yellow, veins entirely yellow; transverse basal fascia pale to dark brown, narrow anteriorly with antero-apical extent at about humeral break, and expanded to about twice this width at posterior margin. Abdomen mainly very dark brown to black, and usually with metallic purple and blue reflections; T2 with brown pollinosity.

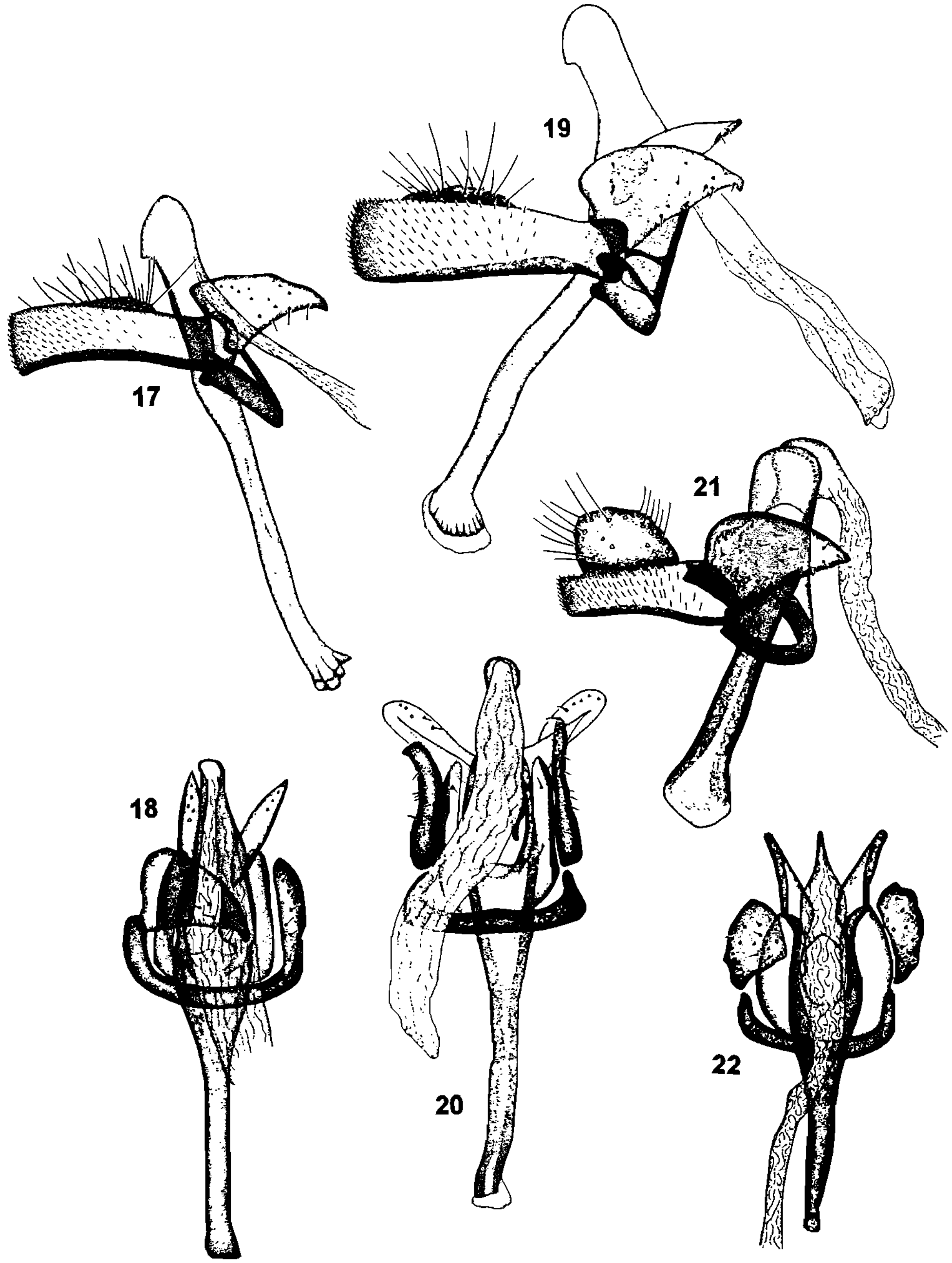
Head (Fig. 7): Eye margin smoothly rounded anterodorsally in profile. Frons moderately short and broad in dorsal view, length at midline usually about two-thirds maximum width (e.g. Fig. 16). Width of face and parafacials together, at mid-height, about 1.0–1.3 X length of antenna. Antenna with short ventral rays along apical one-fifth to three-quarters of arista, longest dorsal rays about 0.8–1.1 X length of third antennal segment. Upper orbital plate inconspicuously developed anteriorly (sharply pointed), here falling short of ptilinal suture by about 1.5–2.0 X length of ocellar triangle, maximum width (near vertex) usually ranging from slightly less to slightly more than width of ocellar triangle (e.g. Fig. 16). Postocellar bristles moderately to well developed, length about 1.1–1.5 X that of ocellar triangle (Fig. 7). Ocellar triangle moderately to well raised above upper eye margin in profile, distance 0.7–1.5 X length of second antennal segment. Proclinate fronto-orbital bristle present, anterior reclinate fronto-orbital usually present and about one-tenth length of posterior bristle. Two vibrissae present. Cheek height in profile about 0.3–0.8 X length of third antennal segment (Fig. 7).

Thorax: Apical scutellar marginal bristles well developed, just more than twice length and strength of basal marginals. Fore femur with one moderately developed anteroventral spine at apical two-fifths, length about 0.5–0.7 X maximum femoral diameter; posterodorsal and posteroventral bristles at similar position, posteroventral usually longer and more strongly developed. Mid tibia without dorsal pre-apical bristle. Wing not markedly slender.

Abdomen: T2 median marginal bristles 1.2–1.7 X length of T1+T2.

Male Postabdomen (Figs 17–27): T6 reduced to relatively elongate, albeit stout, lateral sclerites which are sometimes connected by a slender vestige; each with spiracle 6 in tergum near mid-length of ventral margin. Epandrium always slender to very slender in profile, variable in shape, but usually of similar width along much of length although maximum depth typically at posterior extremity (Figs 17, 19, 23 & 25) (maximum depth at anterior extremity in Mhlopeni specimens, as in Fig. 21). Cerci weakly to moderately developed, varying from inconspicuous to conspicuous in profile, and from contiguous to just separated to well separated, 2.0–3.0 X as long as wide, with elongate vestiture. Hypandrium narrow, usually along almost entire ventral width (e.g. Figs 18 & 24). Epiphallus usually easily visible between postgonites in profile, of moderate length but typically broad and robust and always with smoothly rounded apical region, usually with sharp and backwardly directed posterodorsal projection, in ventral view apical region appearing moderately slender and often somewhat knob-like (e.g. Figs 18, 20 & 27) (appearing laterally compressed in Mhlopeni specimens, as in Fig. 22); postgonite subequal in length to epiphallus, usually narrower basally and broadening to robust, flattened, albeit smoothly rounded apical region, which bears a series of setulae along apical margin (e.g. Figs 21, 23 & 25). Surstylus with visible extent just less than half to about three-quarters length of epandrium, broad basally and usually somewhat rounded dorso-basally as in Figs 19, 21 & 23, although here sometimes reasonably sharply pointed and often followed by a small indentation (Fig. 26) in specimens from disjunct localities (5 km W. Clanwilliam, Mpofu Game Reserve, Maqonqo hills, Bloemfontein), thereafter moderately to markedly tapered to slender or very slender apical region which is typically sharply pointed and sometimes downcurved, vestiture short and moderately profuse.

Female postabdomen: Ventral receptacle complex (normally C-shaped), strongly sclerotised and broader basal section with slender, weakly sclerotised distal extension showing reverse coiling as in Fig. 35.



Figs 17–22. Male terminalia of *Afrocamilla armata* (Hackman, 1960) from selected South African localities, showing variation in shape of epandrium, epiphallus, postgonite, and especially surstylus [all vestiture included]. 17–18. Profile and ventral view, holotype, Skoorsteenkop, Hout Bay, Western Cape. [Internal details of epiphallus were obscure and are not detailed]. 19–20. Profile and ventral view, Mpofu Game Reserve, Eastern Cape. 21–22. Profile and ventral view, Mhlopeni River, Muden, KwaZulu-Natal.

Other material examined: SOUTH AFRICA: **Free State**: 1♂1♀ (in alcohol), Bloemfontein Botanical Gardens, 9.i.1993, R. Miller (NMSA). **KwaZulu-Natal**: 1♂1♀, #13, Maqonqo hills, Vaalkop farm, 28°20'S:30°26'E, 17.ii.1992, A. E. Whittington, Hyrax faeces in cave, 1200 m (NMSA); 1♂6♀, #40, Mhlopeni River, Muden, 29°01'S:30°25'E, 24.iv.1991, A. E. Whittington, dry bushveld, riverine, 900 m (NMSA); 1♂1♀, #137, Farm Rensburg's Spruit, East of Estcourt, 28°59'S:29°57'E, 13.xii.1995, D. A. Barraclough, 1100 m (NMSA); 3♀, Farm Rensburg's Spruit, Estcourt District, 22.xi.1994, B. R. Stuckenberg, hyrax latrine at base of cliff in valley bushveld (NMSA); 2♂4♀, #45, Royal Natal Nat. [ional] park, rock scree at Main Office Area, 28°41'S:28°57'E, 3.ix.1992, Barraclough & Whittington, 1400 m (NMSA); 1♂, Royal Natal National Park, 13.ix.1963, B. & P. Stuckenberg, From montane forest [below Tendele camp], 1500 m (NMSA). **Eastern Cape**: 4♂3♀,3 unsexed, #10, Mpofu Game Reserve, 32°34'S:26°32'E, 23.ii.1997, D. Barraclough/S. James, Yellowwood Forest, 600 m (NMSA). **Western Cape**: 4♂4♀, 2 unsexed, #104, 5 km W. Clanwilliam, 32°12'S:18°52'E, 30.viii.1995, J. & A. Londt, Rocky area, flowers, 270 m (NMSA).

Further material seen: SOUTH AFRICA: **KwaZulu-Natal**: 1♀, #21, Itala Game Reserve, 27°31'S:31°14'E, 27–29.iii.1996, D. A. Barraclough, Woodland/Thornveld, 800 m (NMSA); 1♀, Mhlatuzana River area, Jackson's Falls, 29°48'S:30°45'E, 26.i.1996, D. A. Barraclough, Indig. Forest, 500 m (NMSA). **Northern Cape**: 1♀, Klipkoppie, Niewoud[t]ville Wild Flower Reserve, 31°21'S:19°08'E, 6.ix.1992, J. Manning, 790 m (NMSA). **Western Cape**: 1♀, #51, Hoy's Hill, Hermanus, 34°25'S:19°14'E, 7.x.1993, J. G. H. Londt, Flowers & dassie hole, 60 m (NMSA); 1♀, Hoy's Koppie, Hermanus, 34°24'S:19°15'E, 19.iv.1992, J. G. H. Londt, Rocky hill in town, 200 m (NMSA).

Discussion: The females listed under 'Further material seen' are likely to belong to *armata*, but are excluded from the redescription as there are no associated males. All seem to concur with most character states of *armata*, but definite placement must await the discovery of associated males, given the difficulties caused by marked intraspecific variation in *armata*, and of distinguishing females in the *armata*-complex.

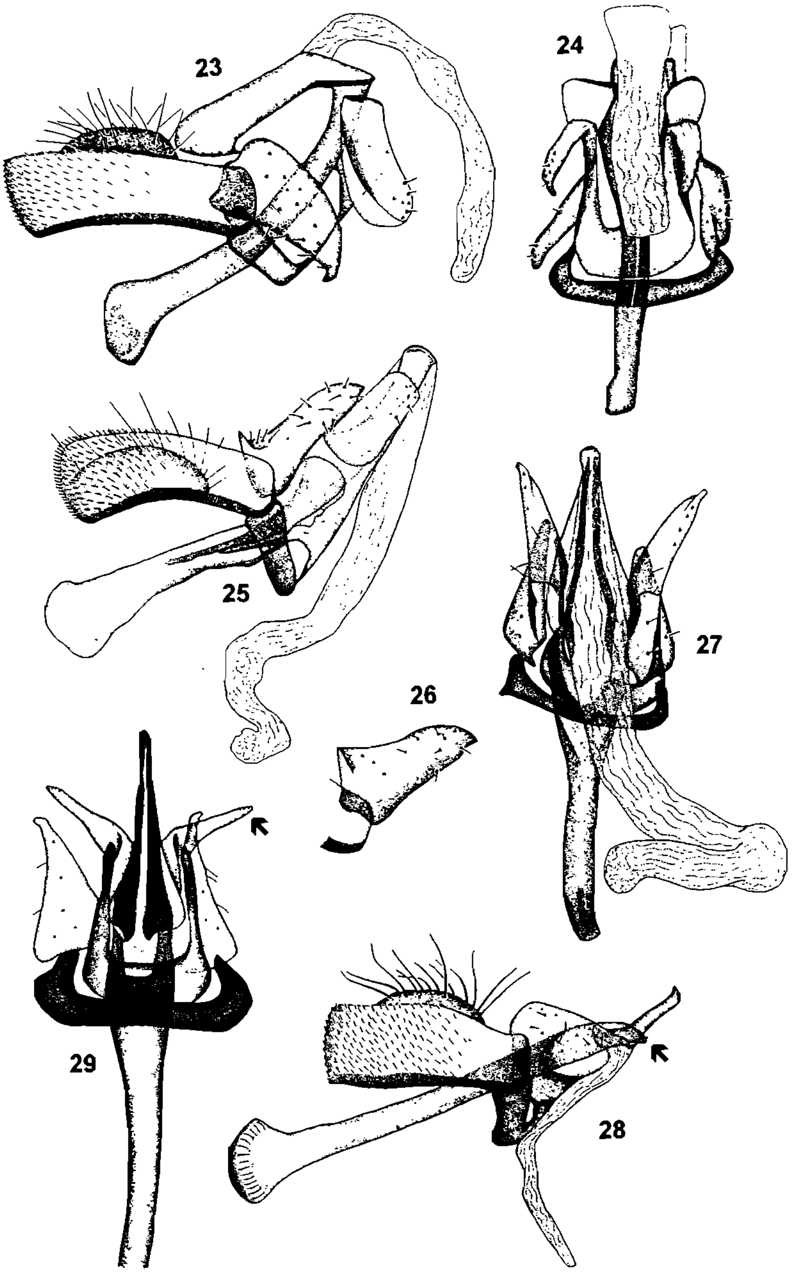
Afrocamilla armata is by far the most widespread species of the genus, being now recorded from the Western Cape, probably the Northern Cape, the Eastern Cape, KwaZulu-Natal and the Free State Provinces of South Africa, as well as Tanzania, Kenya and probably Ethiopia (Barraclough 1992 1997; Papp 1985). It is clearly an opportunistic species, and virtually all records have shown it to be coprophagous, associated with the excrement of baboons in Tanzania (Barraclough 1997) and of hyraxes elsewhere in its range. It is likely that *armata* is associated with the excrement of a variety of mammals. Of its thirteen South African localities (this including 'Further material seen'), only three were not rock hyrax latrines. *A. armata* has been collected from excrement in a wide variety of botanical biomes, the only limitation being the presence of hyraxes. Habitats include rocky hillsides (Fig. 2), at the base of cliffs (Fig. 4), beneath rocky overhangs, beneath large boulders, and even in disturbed habitats such as in rock scree at roadsides. The species occurs sympatrically with other species of *Afrocamilla* in different parts of its range in South

Africa; of note is that it is also sympatric with a species of *Camilla* (probably *manningi* Barraclough, 1993) at 5 km W. Clanwilliam in the Western Cape.

Afrocamilla armata belongs to the *armata* complex of species, which includes the South African species *A. stuckenbergi*, *A. elongata*, as well as the Tanzanian species *A. adusta*. Although there are no difficulties in separating these species on structures of the male terminalia, the limits of *armata* have been enormously difficult to define satisfactorily. In the first two years of my study, I was convinced that the *armata* material available constituted at least three or four species. However, the collection of additional material (with intermediate character states) from further localities in the subsequent four years, has convinced me that *armata* is an unusually variable species; there is marked variation in colour, external structural characters and characters of the male terminalia. There seems to be no particular correlation of colour character states with structural character states. However, specimens collected from the more northerly part of *armata*'s known range in South Africa tend to be more pallid (head, thorax and legs), and much of the material from northern KwaZulu-Natal has entirely pale legs (these typically with at least the basal part of the mid and hind femora darker in other material); this is probably an example of xanthochroism. Colour variation of the head and thorax varies enormously from mostly dark brown to black, to mainly pale (yellow to yellow-brown). This variation occurs within populations, but is most noticeable between allopatric populations collected from different botanical biomes, such as in KwaZulu-Natal material from montane woodland/forest (Royal Natal National Park, Drakensberg mountains), in contrast to material from valley bushveld near Estcourt or at Mhlopeni near Muden.

Structural variation is most evident in the male terminalia, although variation in some external characters states (such as the depth of the cheek in profile) is also marked (see redescription). I have dissected and examined the male terminalia from all available localities, and have found significant variation in the following characters: shape of the epandrium in profile, shape and development of the surstylus in profile, shape of the epiphallus in both profile and ventral view (see Figs 17–27). I am satisfied that all such shapes form a virtual continuum if sufficient material is examined, so the variation is thus intraspecific. There does seem to be a disjuncture between the surstylic form figured for the Maqonqo material from northern KwaZulu-Natal (Fig. 25), and material from most other South African localities (e.g. Figs 17, 19, 21 & 23), although the shape of the Maqonqo surstylus is more accurately reflected in Fig. 26 (it is obliquely positioned in Fig. 25). A slightly variable form of this surstylus occurs in material from three other South African localities (5 km W. Clanwilliam, Mpofu Game Reserve, Bloemfontein), and I am convinced that more extensive collecting in South Africa will reveal surstylic forms intermediate between the Maqonqo form and those from other localities. I therefore include material with the Maqonqo form of surstylus in a wider concept of *armata*. Of special note is that the surstylus of a specimen of *armata* from East Africa (see Barraclough 1997: Fig. 12) represents the intermediate form which has not yet been discovered in South African material.

Afrocamilla armata has close affinity with both *A. elongata* and *A. stuckenbergi*, and is probably more closely related to *elongata*. It is readily distinguished from



Figs 23–29. Male terminalia of *Afrocamilla* species from selected localities in KwaZulu-Natal. 23–27. *A. armata* (Hackman, 1960), showing variation in shape of epandrium, epiphallus, postgonite and especially surstylus [all vestiture included]. 23–24. Profile and ventral view, Royal Natal National Park, showing backwards displacement of epiphallus and downward displacement of postgonite evident in some specimens of *Afrocamilla*. 25–27. Maqonqo hills. 25. Profile (surstylus in oblique view). 26. Surstylus in profile. 27. Ventral view. 28–29. *A. elongata* sp. n., Merrivale, profile and ventral views, showing characteristic shape of epiphallus, and postgonite (arrowed) [all vestiture included].

stuckenbergi which has a much deeper epandrium in profile (Fig. 33), and from *elongata* by characters of the epiphallus and postgonite. In *armata* the epiphallus is robust and broadly rounded apically (e.g. Fig. 19), whereas in *elongata* it is elongate, slender and sharply pointed apically (Fig. 28), while in *armata* the postgonite is stout and broadly rounded apically (e.g. Fig. 21), but is slender and relatively sharply pointed apically in *elongata* (Fig. 28). The only other species in the *armata*-complex is *A. adusta* (Tanzania), which is more strongly distinguished by the sharply pointed postgonite and the unusually short and slender surstylus (see Barraclough 1997: Fig. 10).

Afrocamilla artopenna sp. n.

Figs 5, 8, 13, 40

Etymology: L. *artus* = narrow, tight, close; L. *penna* = wing. Refers to the unusually narrow wing of this species.

Holotype ♀ : SOUTH AFRICA: **KwaZulu-Natal**: 'Ndumu Reserve / Ingwavuma District / Tongaland S.Africa / B. & P.Stuckenberg / 1–10 December 1963'; 'HOLOTYPE ♀ / *Afrocamilla* / *artopenna* / Barraclough, 1997' [Rectangular card, red perimeter]. In NMSA. In good condition.

Description (based on unique female holotype):

Dimensions (in mm): Body length (2.3); wing length (2.0).

Colour/Pollinosity: Head predominantly yellow or yellow-brown, but upper orbital plate, ocellar triangle and dorsomedial section of occiput medium brown, posterior half of frons slightly darker, and proboscis and palpus dark brown to black; pollinosity largely absent, very faintly silver on occiput and cheek. Thorax mainly yellow or yellow-brown, but irregularly medium brown on mesonotum (as paired median vittae which fuse on posterior half of mesonotum, and as sublateral vittae along entire extent) and on pleuron at level of humeral callus, notopleural setae and wing base, and noticeably white to cream on prosternum and entire area below humeral callus; pollinosity mostly absent, but visible as a silver streak along posteroventral margin of sternopleuron and more broadly so (but more sparsely) between haltere and wing base. Legs almost entirely cream to pale yellow-brown, coxae and trochanters mostly cream. Wing membrane pale, smoky yellow, veins entirely pale yellow; transverse basal fascia pale to medium brown, appearing narrower anteriorly with antero-apical extent just beyond humeral break, and expanded towards posterior margin. Abdomen with T1+T2 largely pale (yellow to yellow-brown) although edged with medium brown, T3–T5 largely dark brown to black, except excavate section of T3 pale; pollinosity indistinct.

Head (Fig. 8): Eye margin relatively abruptly angled anterodorsally in profile. Frons markedly short and broad in dorsal view, length at midline just less than half maximum width (Fig. 13). Width of face and parafacials together, at mid-height, about 1.2–1.3 X length of antenna. Antenna with short ventral rays along apical half to two-thirds of arista, longest dorsal rays about 1.2 X length of third antennal segment. Upper orbital plate conspicuously developed anteriorly, here falling short of ptilinal suture by about length of ocellar triangle, maximum width (near vertex) about 1.2 X width of ocellar triangle (Fig. 13). Postocellar bristles weakly to moderately developed, length about three-quarters that of ocellar triangle (Fig. 8). Ocellar triangle moderately to well raised above upper eye margin in profile, distance just less than length of second antennal segment. Proclinate fronto-orbital bristle absent (minute pale hair just visible), anterior reclinate fronto-orbital absent although posterior reclinate fronto-orbital well developed. Two vibrissae present. Cheek height in profile about 0.2–0.3 X length of third antennal segment (Fig. 8).

Thorax (Fig. 5): Apical scutellar marginal bristles moderately well developed, slightly shorter and weaker than basal marginals. Fore femur with one well-developed anteroventral spine at apical two-fifths, length about 0.6–0.7 X maximum femoral diameter; posterodorsal and posteroventral bristles at similar position, posterodorsal weakly developed but posteroventral longer and more strongly developed. Mid tibia without dorsal pre-apical bristle. Wing markedly narrow (Fig. 5).

Abdomen: T2 median marginal bristles detached, their length relative to that of T1+T2 therefore not measureable.

Female postabdomen: Ventral receptacle and spermathecae not found.

Discussion: Although no biological data are available for this species, it cannot be associated with hyrax latrines, as hyraxes are absent from the type locality in northeastern KwaZulu-Natal (Davies 1997; Pringle 1975; Smithers 1983).

Afrocamilla artopenna stands disjunct from other South African species, which suggests that further related, undescribed species may be discovered in southeast Africa. It also has no affinity with the tropical African species of *Afrocamilla* (Barraclough 1997) and those of the southwestern United States (Barraclough & Wheeler 1995).

Character states which are significantly different from other South African species are: head, thorax and legs almost entirely pale; frons markedly short and broad, length at midline about half maximum width; anterior reclinate fronto-orbital bristle absent; wing unusually narrow; basal scutellar marginal bristles slightly longer and stronger than apical marginals (the last being the best diagnostic character state).

Afrocamilla carolae sp. n.

Figs 12, 14, 40

Etymology: Named for my wife, Carol, in gratitude for her patience and assistance during my field trips over many years.

Holotype ♂: SOUTH AFRICA: **Eastern Cape**: 'S AFRICA: E Cape #10 / Mpofu Game Reserve / 32°34'S:26°32'E 600m / 23.ii.1997 / D. Barraclough / S. James [Barraclough and James on same line] / Yellowwood forest'; 'HOLOTYPE ♂ / *Afrocamilla* / *carolae* / Barraclough, 1997' [Rectangular card, red perimeter]. In NMSA. In fair condition.

Description (based on unique male holotype):

Dimensions (in mm): Body length (2.3); wing length (2.0).

Colour/Pollinosity: Head predominantly very dark brown to black, but anterior two-thirds of cheek dark yellow-brown, face medium brown although paler dorsally, second and third antennal segments partly yellow-brown, and anterior half of frons dark yellow-brown; pollinosity silver, restricted to occiput (moderately dense) and upper facial region (relatively sparse). Thorax mainly dark brown to black, but humeral callus yellow to yellow-brown and mesonotum with metallic blue reflections on posterior half; pollinosity dense and yellow to brown on scutellum, more difficult to discern but visible along posteroventral margin of sternopleuron (silver) and between haltere and scutellum (ranging from silver below to brown above). Legs mostly yellow to pale yellow-brown, but mid and hind femora darker brown tinged on apical half and third respectively and mid and hind tibiae darker tinged on basal half and third respectively. Wing membrane virtually hyaline, veins entirely yellow; transverse basal fascia medium to dark brown, narrow anteriorly with antero-apical extent at about humeral break, and expanded to about twice this width at posterior margin. Abdomen black with obvious metallic purple reflections; T2 with sparse brown pollinosity.

Head (Fig. 12): Eye margin smoothly rounded anterodorsally in profile. Frons moderately short and broad in dorsal view, length at midline almost two-thirds maximum width (Fig. 14). Width of face and parafacials together, at mid-height, about 0.9 X length of antenna. Antenna with short ventral rays along apical half to two-thirds of arista, longest dorsal rays about 0.9 X length of third antennal segment. Upper orbital plate inconspicuously developed anteriorly, here falling short of ptilinal suture by about 1.5 X length of ocellar triangle, maximum width (near vertex) about 0.9 X width of ocellar triangle (Fig. 14). Postocellar bristles moderately to well developed, length about 1.1–1.2 X that of ocellar triangle (Fig. 12). Ocellar triangle moderately to well raised above upper eye margin in profile, distance just less than length of second antennal segment. Proclinate fronto-orbital bristle absent, anterior reclinate fronto-orbital present (proclinate on left side) and about one-eighth length of posterior bristle. Two vibrissae present. Cheek height in profile about 0.5 X length of third antennal segment (Fig. 12).

Thorax: Apical scutellar marginal bristles well developed, almost twice length and strength of basal marginals. Fore femur with one well-developed anteroventral spine at apical two-fifths, length about 0.6–0.7 X maximum femoral diameter; posterodorsal and posteroventral bristles at similar position, posterodorsal moderately developed but posteroventral strongly and conspicuously developed. Mid tibia without dorsal pre-apical bristle. Wing not markedly slender.

Abdomen: T2 median marginal bristles about 1.5 X length of T1+T2.

Male postabdomen: No structures dissected or illustrated (see discussion below).

Discussion: The unique male holotype, although in good condition, is inappropriately mounted, and the postabdomen cannot be reomoved. Illustration of the male terminalia will have to await the collection of further material.

Afrocamilla carolae occurs sympatrically with *A. elongata*, *A. confusa* and *A. armata* at the type locality, where all four species were collected from hyrax excrement at the sheltered base of a rocky precipice, in the midst of dense *Podocarpus* forest (Figs 3 & 4). Based on the lack of a proclinate fronto-orbital bristle, *A. carolae* has affinity with *A. sineseta* (South Africa) and an undescribed species from Kakamega Forest in western Kenya (see Barraclough 1997). *A. exculta* and *A. artopenna* also lack a proclinate fronto-orbital, but have significantly different suites of character states and are clearly unrelated. The undescribed Kenyan species differs in having the cheek much shallower in profile (one sixth instead of one-half the length of the third antennal segment), and has paler thoracic ground colour (brown instead of black), and the frons entirely dark. *A. sineseta*, which is probably the sister species of *A. carolae*, differs in having at least part of the humeral callus pale, the anterior half of the dark mesonotum with paler medial and lateral vittae, and the cheek height in profile noticeably shallower, i.e. 0.2–0.3 X the length of the third antennal segment (see species key).

Afrocamilla confusa sp. n.

Figs 10, 15, 30–31, 40

Etymology: The name refers to the anomalous combination of character states in this species, reminiscent of the genus *Camilla*.

Holotype ♀ : SOUTH AFRICA: **Eastern Cape**: 'S AFRICA: E Cape #10 / Mpofu Game Reserve / 32°34'S:26°32'E 600m / 23.ii.1997 / D. Barraclough / S. James [Barraclough and James on same line] / Yellowwood forest'; 'HOLOTYPE ♀ / *Afrocamilla* / *confusa* / Barraclough, 1997' [Rectangular card, red perimeter]. In NMSA. In good condition.

Description (based on both sexes):

Dimensions (in mm): Body length 2.6–2.7 (2.7); wing length 2.2–2.3 (2.3).

Colour/Pollinosity: Head mainly yellow to yellow-brown, but upper two-fifths of occiput, entire ocellar triangle, most of arista and about posterior half of frons (indistinctly) darker brown; pollinosity silver to yellow, relatively sparse and mainly restricted to occiput. Thorax mainly a dark, golden, yellow-brown, although posterior half of mesonotum somewhat darker, humeral callus and notopleural region darker brown, scutellum partly or entirely dark brown and pleuron entirely medium to dark brown, except propleuron and mesopleuron mainly yellow-brown; pollinosity relatively dense and yellow on scutellum, more difficult to discern but visible along posteroventral margin of sternopleuron (silver) and between hypopleuron and scutellum (ranging from silver below to pale brown above). Legs entirely yellow to yellow-brown. Wing membrane virtually hyaline, veins entirely yellow; transverse basal fascia absent, although some very pale colouring sometimes apparent. Abdomen dark brown to black with metallic purple and blue reflections; T2 with sparse brown pollinosity.

Head (Fig. 10): Eye margin smoothly rounded anterodorsally in profile. Frons moderately short and broad in dorsal view, length at midline almost two-thirds maximum width (Fig. 15). Width of face and parafacials together, at mid-height, about 0.8 X length of antenna. Antenna with short ventral rays along apical two-thirds to three-quarters of arista, longest dorsal rays about 1.0–1.1 X length of third antennal segment. Upper orbital plate inconspicuously developed anteriorly (ending just posterior to proclinate bristle), here falling short of ptilinal suture by about 1.5 X length of ocellar triangle, maximum width (near vertex) about 0.7–0.8 X width of ocellar triangle (Fig. 15). Postocellar bristles moderately to well developed, length about 1.1–1.3 X that of ocellar triangle (Fig. 10). Ocellar triangle moderately raised above upper eye margin in profile, distance about 0.8–1.0 X length of second antennal segment. Proclinate fronto-orbital bristle present, anterior reclinate fronto-orbital present and about one-eighth length of posterior bristle. Two vibrissae present. Cheek height in profile about 0.7–0.8 X length of third antennal segment (Fig. 10).

Thorax: Apical scutellar marginal bristles well developed, almost twice length and strength of basal marginals. Fore femur with one well-developed anteroventral spine at apical two-fifths, length about 0.6–0.7 X maximum femoral diameter; posterodorsal and posteroventral bristles at similar position, posterodorsal moderately developed and posteroventral only slightly shorter and weaker. Mid tibia without dorsal pre-apical bristle. Wing not markedly slender.

Abdomen: T2 median marginal bristles markedly short, only about 1.2–1.3 X length of T1+T2 in holotype (missing from male paratype).

Male postabdomen (Figs 30 & 31): T6 reduced to relatively elongate – albeit stout – lateral sclerites which are connected by a slender vestige; each with spiracle 6 in tergum near ventral margin. Epandrium slender, of similar width along much of length in profile (Fig. 30). Cerci moderately developed, reasonably conspicuous in profile and relatively well separated, 3.5 X as long as wide, with elongate vestiture. Hypandrium reasonably narrow along much of width, but noticeably broader at lateral extremities below surstyli (Fig. 31). Epiphallus easily visible between postgonites in profile, of moderate length and relatively robust, broader basally and narrowing apically, with mostly smoothly rounded knob-like apical region, in ventral view apical region appearing slender and slightly knob-like (Fig. 31); postgonite shorter than epiphallus, markedly broader basally and narrowing to reasonably smoothly rounded apical region, one prominent, elongate ventrally directed setula at about mid-length (Fig. 30). Surstylus with visible extent just less than half length of epandrium, unusually slender in appearance, slightly narrowed basally and then slightly broadened at mid-length where it is smoothly arched dorsally, terminating in sharply pointed and downwardly-directed apical region, vestiture short and moderately profuse (Fig. 30).

Female postabdomen: Not dissected (holotype the only available female).

Other material examined: SOUTH AFRICA: **KwaZulu-Natal**: Paratype: 1♂, #21, Itala Game Reserve, 27°31'S:31°14'E, 27–29.iii.1996, D. A. Barraclough, Woodland/Thornveld, 800 m (NMSA).

Discussion: A female of this distinctive species was designated as holotype, as the only available male is poorly pinned and lacks the T2 marginal bristles.

The holotype was collected from hyrax excrement at Mpofu Game Reserve, where it occurs sympatrically with *A. armata*, *A. elongata* and *A. carolae* (see under *carolae*); the male paratype was also collected from hyrax excrement, although the locality at Itala Game Reserve differs in that the latrine was sited well beneath large boulders on a rocky hillside with scattered forest patches. Two other females of *Afrocamilla* were collected from the same locality at Itala, but their identity is unclear; at least one of them is probably *A. armata*.

A. confusa is unique in lacking the transverse basal fascia on the wing; the T2 median marginal bristles are also unusually short, although T2 and T3 are modified as in other *Afrocamilla* species. The insertion of the proclinate fronto-orbital bristle anterior to the upper orbital plate (Fig. 15) is also unusual. As with other *Afrocamilla* species there is only one sternopleural bristle. The relationship of *confusa* with other species is unclear; the distinctive male terminalia (Fig. 30) confirm that it has no close relatives.

Afrocamilla elongata sp. n.

Figs 11, 16, 28–29, 40

Etymology: The species name refers to the unusually elongate epiphallus, which is conspicuous in profile.

Holotype ♂: SOUTH AFRICA: **KwaZulu-Natal**: 'SOUTH AFRICA: Natal / Merrivale / 29°31' "S:30°15' "E / 29.x.1990 / B. R. Stuckenberg / AT LIGHT'; 'HOLOTYPE ♂ / *Afrocamilla* / *elongata* / Barraclough, 1997' [Rectangular card, red perimeter]. In NMSA. In good condition.

Description (based on both sexes):

Dimensions (in mm): Body length 2.1–3.1 (2.5); wing length 1.9–2.7 (2.2).

Colour/Pollinosity: Head mostly brown to dark brown or black, but anterior three quarters to entire cheek yellow-brown (sometimes partly so), second, and third (partly to entirely) antennal segments and parafacial (usually) yellow to yellow-brown, facial region sometimes partly yellow-brown, and about anterior half of frons with ground colour yellow to yellow-brown (sometimes evident at certain angles only, rarely barely so); pollinosity silver to brown, mainly restricted to occiput but sometimes evident on upper half of face and parafacial (silver). Thorax mostly medium to dark brown and sometimes very dark brown to black, but usually humeral callus (including pleuron immediately below) and irregularly developed medial and lateral presutural vittae (sometimes broad and partially fused) yellow, although when vittae broad and well developed they may extend beyond sutural region; indistinct metallic blue or purple reflections sometimes visible on posterior half of mesonotum; pollinosity dense and yellow to brown on scutellum, more difficult to discern but visible along posteroventral margin of sternopleuron (silver) and broadly from hypopleuron to scutellum (typically silver below ranging to brown above). Legs mostly pale yellow to pale yellow-brown, but hind and particularly mid femora with about apical half brownish tinged (sometimes barely so), basal half of mid and hind tibiae sometimes also brown-tinged. Wing membrane virtually hyaline to pale smoky yellow, veins entirely yellow; transverse basal fascia pale to dark brown, narrow anteriorly with antero-apical extent at about humeral break, and expanded to about twice this width at posterior margin. Abdomen mainly very dark brown to black with metallic purple and blue reflections; T2 with brown pollinosity.

Head (Fig. 11): Eye margin smoothly rounded anterodorsally in profile. Frons moderately short and broad in dorsal view, length at midline about three-quarters or slightly more than maximum width (Fig. 16). Width of face and parafacials together, at mid-height, about 1.0–1.3 X length of antenna. Antenna with short ventral rays along apical one-fifth to two-thirds of arista, longest dorsal rays about 0.9–1.0 X length of third antennal segment. Upper orbital plate inconspicuously developed anteriorly (sharply pointed), here falling short of ptilinal suture by about 1.5–2.0 X length of ocellar triangle, maximum width (near vertex) slightly less than width of ocellar triangle (Fig. 16). Postocellar bristles moderately to well developed, length about 1.0–1.4 X that of ocellar triangle (Fig. 11). Ocellar triangle moderately to well raised above upper eye margin in profile, distance 0.9–1.2 X length of second antennal segment. Proclinate fronto-orbital bristle present, anterior reclinate fronto-orbital usually present and about one-tenth length of posterior bristle. Two vibrissae present. Cheek height in profile about 0.3–0.4 X length of third antennal segment (Fig. 11).

Thorax: Apical scutellar marginal bristles well developed, about twice length and strength of basal marginals. Fore femur with one well-developed anteroventral spine at apical two-fifths, length about 0.5–0.7 X maximum femoral diameter; posterodorsal and posteroventral bristles at similar position, posterodorsal moderately developed but posteroventral strongly and conspicuously developed. Mid tibia without dorsal pre-apical bristle. Wing not markedly slender.

Abdomen: T2 median marginal bristles 1.5–2.0 X length of T1+T2.

Male Postabdomen (Figs 28 & 29): T6 reduced to short, relatively stout and subquadrate, widely separated lateral vestiges with spiracle 6 in tergum near inner ventral margin. Epandrium moderately slender to reasonably robust in profile, maximum depth at about mid-length, depth less at posterior end and more markedly so anteriorly (Fig. 28). Cerci weakly to moderately developed and sometimes inconspicuous, contiguous to just separated to well separated, 2.0–3.0 X as long as wide, with elongate vestiture. Hypandrium reasonably narrow along most of ventral width, but noticeably broader at lateral extremities below surstyli (Fig. 29). Epiphallus easily visible between postgonites in profile, with apical region sharply upcurved and hook-like, in ventral view apical region slender and elongate but not sharply pointed at extreme apex (Fig. 28); postgonite relatively short, apical part laterally directed in all specimens examined, broader basally and narrowing to relatively slender apical region (Fig. 28). Surstylus with visible extent just less than three-fifths to just less than three-quarters length of epandrium, broad basally and somewhat rounded dorso-basally, thereafter markedly tapered to very slender apical region which is sharply downcurved, vestiture short and moderately profuse (Fig. 28).

Female postabdomen: Ventral receptacle complex (not C-shaped), strongly sclerotised and broader basal section with slender, weakly sclerotised distal extension showing reverse coiling as in Fig. 36.

Other material examined: SOUTH AFRICA: Paratypes: **KwaZulu-Natal**: 1 unsexed, #137, Farm Rensburg's Spruit, East of Estcourt, 28°59'S:29°57'E, 13.xii.1995, D. A. Barraclough, 1100 m (NMSA); 4♂6♀, 2 unsexed, Merrivale (Farm TshwalaBenyoni), 29°31'S:30°15'E, 16–22.x.1990, 29.x.1990, 5.xi.1990, 20.x.1992, 28.i.1996, B. R. Stuckenberg, (1000 m), At light/window (NMSA); 1♂, 2 unsexed, Pietermaritzburg, 14.xi.1983, R. M. Miller, On window (NMSA). **Eastern Cape**: 3♂4♀, 1 unsexed, #10, Mpofu Game Reserve, 32°34'S:26°32'E, 23.ii.1997, D. Barraclough/S. James, Yellowwood forest, 600 m (NMSA).

Discussion: *Afrocamilla elongata* is known from the KwaZulu-Natal midlands (three localities), where it occurs mainly in areas of valley bushveld, and also from the Mpofu Game Reserve (in *Podocarpus* forest), almost 25 km north of Fort Beaufort in the Eastern Cape. At the Mpofu locality (see discussion under *A. carolae*), where it occurs sympatrically with *A. armata*, *A. carolae* and *A. confusa*, all four species were collected from hyrax excrement. In KwaZulu-Natal *elongata* was typically collected from hyrax excrement, or in areas near to hyrax colonies, with some specimens collected at light or windows. The specimens collected in Pietermaritzburg were from a house window in suburbia, so the species is likely to have an association with the droppings of other small mammals such as bats, or of birds.

Afrocamilla elongata has affinity with both *A. armata* and *A. stuckenbergi*, and is probably more closely related to *armata*. It is readily distinguished from *stuckenbergi* which has a much deeper epandrium in profile (Fig. 33), and from *armata* by characters of the epiphallus and postgonite. In *elongata* the epiphallus is elongate, slender and sharply pointed apically (Fig. 28), whereas it is robust and very broadly rounded apically in *armata* (e.g. Figs 19, 21 & 25), while in *elongata* the postgonite is slender and relatively sharply pointed apically (Fig. 28), whereas it is stout and broadly rounded apically in *armata* (e.g. Figs 21, 23 & 25). The only other species in the *armata*-complex is *A. adusta* (Tanzania), which is strongly distinguished by the unusually short and slender surstylus and the relatively short and stout epiphallus (see Barraclough 1997: Fig. 10).

Afrocamilla sineseta sp. n.

Figs 9, 32, 40

Etymology: L. *sine* = without; seta = bristle. Refers to the lack of a proclinate fronto-orbital bristle.

Holotype ♂: SOUTH AFRICA: **Northern Province**: '6505'; 'S AFRICA:N. Transvaal / Entabeni For[est] Station / Zoutpansberg Range / Jan. 1975 Stuckenberg / indigenous for. 2230CC'; 'Registered / Specimen / S F McEvey'; 'HOLOTYPE ♂ / *Afrocamilla* / *sineseta* / Barraclough, 1997' [Rectangular card, red perimeter]. In NMSA. In fairly good condition, but right wing torn apically.

Description (based on both sexes):

Dimensions (in mm): Body length 2.6–3.4 (2.7); wing length 2.4–2.7 (2.3).

Colour/Pollinosity: Head mostly dark brown to black (frons with purple metallic reflections on posterior half), but anterior three quarters of cheek yellow-brown, face yellow-brown to medium brown, second antennal segment and base of third yellow-brown (third mostly yellow-brown in Rietvlei paratype), and anterior half of frons yellow-brown; pollinosity silver to brown, restricted mainly to occiput (moderately dense) and upper facial region (relatively sparse). Thorax mostly medium to dark brown, but (at least part of) humeral callus, and medial and lateral presutural vittae yellow (sometimes partly and inconspicuously developed) although lateral yellow vitta sometimes extends beyond sutural region; pollinosity dense and silver to brown on scutellum, more difficult to discern but visible along posteroventral margin of sternopleuron (silver) and between haltere and scutellum (ranging from silver below to brown above). Legs mostly pale yellow to pale yellow-brown, but mid and hind femora with apical two-thirds to seven-eighths brown-tinged (sometimes barely so), and mid and hind tibiae with basal third to half indistinctly brown-tinged. Wing membrane virtually hyaline to pale smoky yellow, veins entirely yellow; transverse basal fascia pale to medium brown, narrow anteriorly with antero-apical extent at about humeral break, and expanded to twice this width at posterior margin. Abdomen dark brown to black with metallic purple and blue reflections; T2 with brown pollinosity.

Head (Fig. 9): Eye margin smoothly rounded anterodorsally in profile. Frons moderately short and broad in dorsal view, length at midline about two-thirds to three-quarters maximum width (e.g. Fig. 14). Width of face and parafacials together, at mid-height, about 1.1–1.2 X length of antenna. Antenna with short ventral rays along apical two-thirds of arista, longest dorsal rays about 1.0 X length of third antennal segment. Upper orbital plate reasonably conspicuously developed anteriorly, here falling short of ptilinal suture by about 1.2–1.6 X length of ocellar triangle, maximum width (near vertex) subequal to or slightly less than width of ocellar triangle (e.g. Fig. 14). Postocellar bristles moderately to well developed, length about 0.9–1.2 X that of ocellar triangle (Fig. 9). Ocellar triangle moderately to well raised above upper eye margin in profile, distance 0.8–1.1 X length of second antennal segment. Proclinate fronto-orbital bristle absent, anterior reclinate fronto-orbital present and about one-tenth length of posterior bristle. Two vibrissae present. Cheek height in profile about 0.2–0.3 X length of third antennal segment (Fig. 9).

Thorax: Apical scutellar marginal bristles well developed, about twice length and strength of basal marginals. Fore femur with one well-developed anteroventral spine at apical two-fifths, length about 0.5–0.6 X maximum femoral diameter; posterodorsal and posteroventral bristles at similar position, posterodorsal moderately developed but posteroventral strongly and conspicuously developed. Mid tibia without dorsal pre-apical bristle. Wing not markedly slender.

Abdomen: T2 median marginal bristles about 1.5 X length of T1+T2.

Male Postabdomen (Fig. 32): T6 reduced to elongate, separated, strap-like lateral vestiges (sharply narrowed dorsally) with spiracle 6 in tergum near ventral margin. Epandrium extremely slender in profile, of similar width along much of length, although somewhat broader anteriorly (Fig. 32). Cerci well developed and conspicuous, well separated, almost 3.0 X as long as wide, with elongate vestiture. Hypandrium narrow along most of ventral width, but slightly broader at lateral extremities below surstyli. Epiphallus visible between postgonites in profile, in ventral view apical region narrow and somewhat finger-like apically; postgonite not unusually elongate, apical part laterally directed, broad basally and narrowed to relatively sharply pointed apical region (Fig. 32). Surstylus reasonably inconspicuous, with visible extent probably just less than two-thirds length of epandrium, relatively broad basally but thereafter broadened to maximum width at about two-fifths length and then downturned and narrowed to apical region which is blunt-ended and slightly narrower subapically, vestiture short but relatively profuse (Fig. 32).

Female postabdomen: Ventral receptacle and spermathecae not found.

Other material examined: SOUTH AFRICA: Paratype ♀ : **Mpumalanga**: 9 km NW. Sabie, 2530BB, Bridal Veil Falls, 3.xii.1976, R. Miller (NMSA). Other specimens (2♀): **Northern Province**: Entabeni, 23°S:30°15'E, 19–21.viii.1983, Shayne F. McEvey, Swept in forest (NMSA). **KwaZulu-Natal**: nr Rietvlei: Karkloof Forest, 31.v.1977, I. Bampton, Malaise t.[rap] (NMSA).

Discussion: This species is not known to occur sympatrically with any other species of *Afrocamilla*, and all four specimens were collected at different localities. No definite biological data are available, although hyraxes must certainly occur in the Bridal Veil Falls area, where the female paratype was collected; I searched this locality unsuccessfully for additional specimens in February 1995. As both sexes were not collected at the same locality, there is some uncertainty about the association of the sexes, although I am reasonably certain that all three females here included in *sineseta* are conspecific with the male holotype. There is more doubt regarding the identity of the malaise trap-collected Rietvlei female, as the colour and pollinosity of this specimen were affected by its initial storage in ethanol. Both the Rietvlei and Entabeni females are excluded from the type series as they are in poor condition.

Afrocamilla sineseta lacks a proclinate fronto-orbital bristle, and appears to be the sister species of *A. carolae* (see discussion under *carolae*). An apparently unrelated species, still undescribed, from Kakamega Forest in western Kenya (see Barraclough 1997), differs from *sineseta* in having a shallower cheek in profile, the frons entirely dark, the mesonotum without pale vittae anteriorly, and the humeral calli entirely dark.

Afrocamilla stuckenbergi Barraclough, 1992

Figs 6, 33–34, 37–38, 40

Afrocamilla stuckenbergi Barraclough, 1992: 44.

I redescribe *A. stuckenbergi*, as in the five years since its description I have accumulated material from additional localities, and several extra character states are now covered in my descriptions.

Holotype ♂: SOUTH AFRICA: **KwaZulu-Natal**: 'S AFRICA: Natal #45 / Mhlatuzana [River] 18.xii.'90 / 29°48'S:30°45'E 500m / Reared out: 18.i.1991 / Coll: A.E. Whittington / from Hyrax Faeces'; 'HOLOTYPE / *Afrocamilla* / *stuckenbergi* / BARRACLOUGH' [Rectangular card, red perimeter]. In NMSA (Type No. 508). In good condition.

Redescription (based on both sexes):

Dimensions (in mm): Body length 2.2–2.8 (2.7); wing length 1.9–2.6 (2.3).

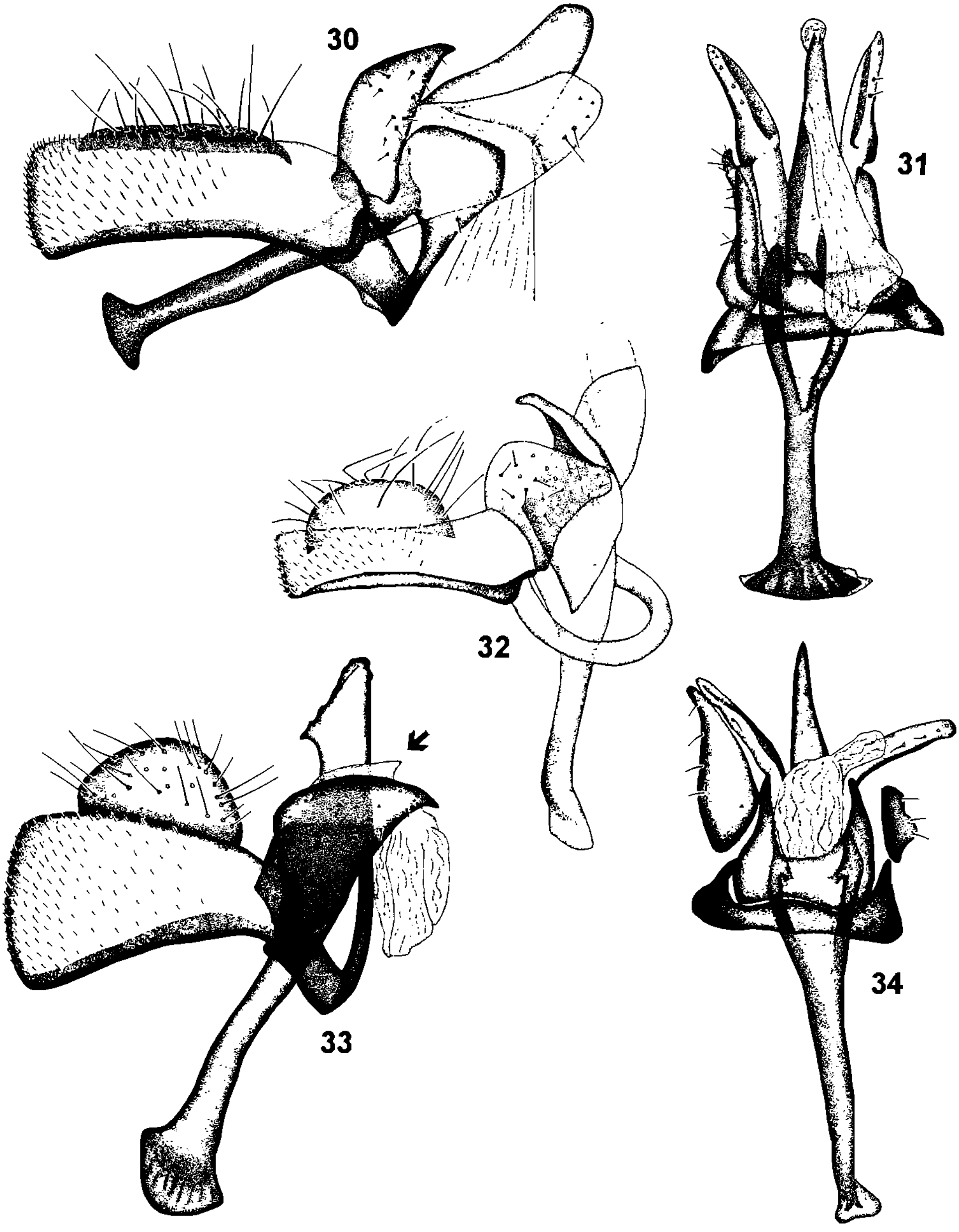
Colour/Pollinosity: Head mostly dark brown to black, but cheek mainly yellow, occiput generally paler ventrally, antenna mostly yellow-orange to pale brown (second segment sometimes partly dark dorsally and third segment sometimes dark along dorsal margin), face, parafacial and epistome yellow (lower and medial section of face sometimes pale brown), and about anterior half to two-thirds of frons with ground colour yellow to orange; pollinosity mainly restricted to occiput (silver to pale brown), but sometimes also apparent on cheek, facial region and parafacial (silver to yellow). Thorax usually dark brown to black, but anterior section of humeral callus and anterior pleural and (usually) mesonotal margins tinged with yellow to dark orange (if visible, pale ground colour vaguely differentiated on mesonotum into paired medial and lateral vittae extending to lateral transverse sutures and just beyond respectively); scutellum sometimes with pale posterior margin just visible beneath pollinosity; mesonotum often with blue and green metallic reflections; pollinosity dense along posterior margin of sternopleuron (silver) and more sparsely so between hypopleuron and scutellum (ranging from silver below to brown above). Legs mostly yellow to very pale brown, but fore femur sometimes brown-tinged dorso-apically, mid and hind femora with apical half to three-quarters brown to dark brown, mid tibia with basal half to two-thirds brown to dark brown, and hind tibia with basal third brown to dark brown (hind femur and tibia rarely mostly pale). Wing membrane virtually hyaline or very pale yellow, veins yellow to pale brown; transverse basal fascia pale to dark brown, narrow anteriorly with antero-apical extent at about humeral break, and usually expanded to about twice this width at posterior margin. Abdomen dark brown to black with metallic violet/blue reflections; T1+2 with brown pollinosity.

Head: Eye margin smoothly rounded anterodorsally in profile. Frons moderately short and broad in dorsal view, length at midline just less than two-thirds to just less than three-quarters maximum width (e.g. Fig. 16). Width of face and parafacials together, at mid-height, about 0.8–1.2 X length of antenna. Antenna with short ventral rays along apical one- to two-thirds of arista, longest dorsal rays 1.1–1.3 X length of third antennal segment. Upper orbital plate inconspicuously developed anteriorly (sharply pointed), here falling short of ptilinal suture by about 1.0–1.5 X length of ocellar triangle, maximum width (near vertex) just less than width of ocellar triangle (e.g. Fig. 16). Postocellar bristles moderately to well developed, length about 1.0–1.4 X that of ocellar triangle. Ocellar triangle weakly to well raised above upper eye margin in profile, distance 0.5–1.2 X length of second antennal segment. Proclinate fronto-orbital bristle present, anterior reclinate bristle usually present and about one-tenth length of posterior bristle. Two vibrissae present. Cheek height in profile about 0.3–0.6 X length of third antennal segment.

Thorax (Fig. 6): Apical scutellar marginal bristles well developed, usually about twice length and strength of basal marginals. Fore femur with one moderately to well developed anteroventral spine at apical two-fifths, length about 0.4–0.6 X maximum femoral diameter; posterodorsal and posteroventral bristles at similar position, posterodorsal moderately developed but posteroventral strongly and conspicuously developed. Mid tibia without dorsal pre-apical bristle. Wing not markedly slender (Fig. 6).

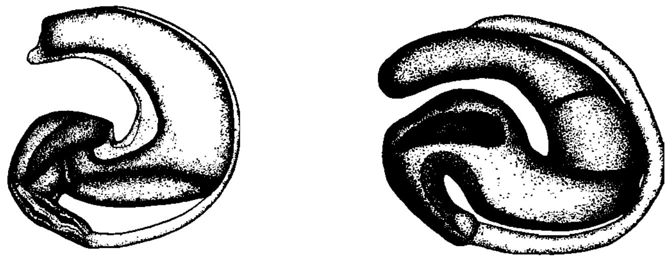
Abdomen: T2 median marginal bristles about 1.2–1.8 X length of T1+T2.

Male postabdomen (Figs 33 & 34): T6 reduced to elongate-ovoid, albeit relatively stout, widely separated lateral vestiges, with spiracle 6 in tergum near mid-length of ventral margin. Epandrium strikingly robust and usually well sclerotised in profile,



Figs 30–34. Male terminalia of *Afrocamilla* species from South Africa. 30–31. *A. confusa* sp. n., Itala Game Reserve, KwaZulu-Natal, profile and ventral views, showing characteristic shape of epiphallus, postgonite and surstylus [all vestiture included]. 32. *A. sineseta*, Entabeni Forest Station, Northern Province, profile view, showing characteristic shape of epiphallus, postgonite and surstylus [all vestiture included]. 33–34. *A. stuckenbergi*, Jackson's Falls, KwaZulu-Natal, profile and ventral views, showing characteristic shape of epandrium, epiphallus and postgonite (sharply pointed apical region arrowed) [all vestiture included].

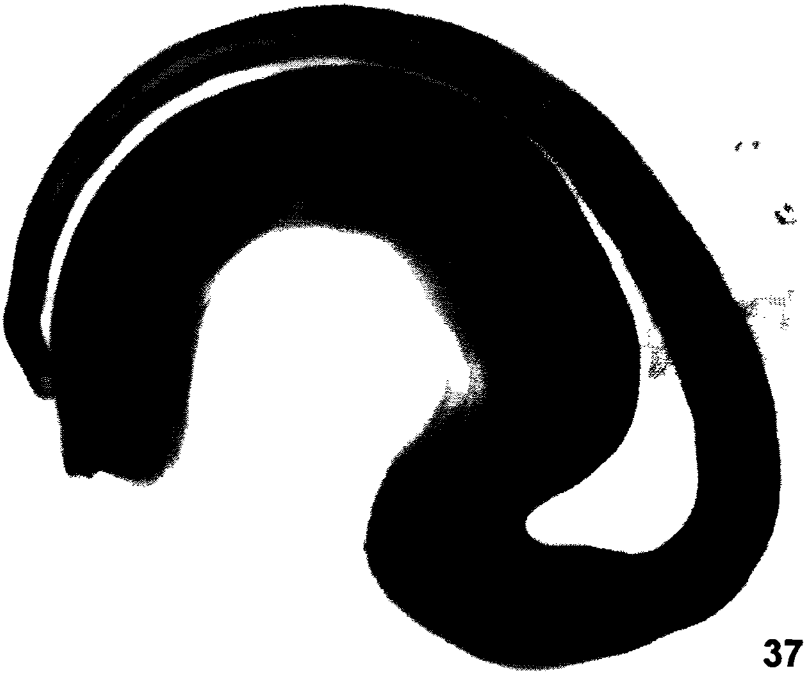
much deeper at posterior extremity, depth here 2.0–4.0 X that at anterior extremity (nearly always 3.0–4.0 X), anterior extremity usually strongly narrowed, shape as in Fig. 33. Cerci nearly always moderately to strongly developed, typically conspicuous in profile, usually relatively closely approximated, about 2.0–2.5 X as long as wide, with elongate vestiture. Hypandrium typically somewhat broad along much of ventral width, usually noticeably narrower towards lateral extremities on each side (Fig. 34), if slender along entire width then much broader at lateral extremities below surstyli. Epiphallus usually visible between postgonites in profile, reasonably elongate, apical region tapered to moderately acute apex (sometimes somewhat rounded), nearly always with characteristic, backwardly directed hook-like projection on posterodorsal margin, in ventral view apical region typically slender but apex varies from appearing laterally compressed (Fig. 34) to slightly knob-like; postgonite of similar length to epiphallus, although nearly always laterally directed, shape triangular (although this not entirely visible in profile), broad basally with relatively sharply pointed apex (Fig. 33), usually more strongly sclerotised on anterior half. Surstylus well developed, visible extent about half to two thirds length of epandrium, usually very broad basally, thereafter sharply tapered in apical half to very slender, downwardly directed, beak-like apical region, vestiture short and moderately profuse (Fig. 33).



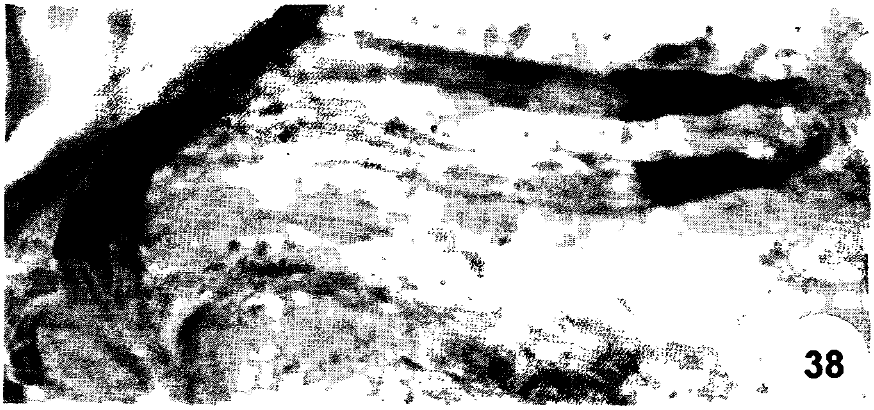
Figs 35–36. Ventral receptacle of *Afrocamilla armata* (Hackman, 1960) from Mhlopeni River, KwaZulu-Natal, and *A. elongata* sp. n. from Merrivale, KwaZulu-Natal respectively. In *armata* the body of the receptacle appears partially collapsed.

Female postabdomen (Figs 37 & 38): Ventral receptacle complex, C-shaped, strongly sclerotised and broader basal section with slender, weakly sclerotised distal extension showing reverse coiling as in Fig. 37. Spermathecae (based on single preparation (Fig. 38)): two present, sclerotised, greatly reduced (more apical membranous region indistinct, here possibly more extensive/telescoped), elongate tubular, broader at base, smooth; sclerotised section of spermathecal duct short, appearing smooth, membranous portion of duct very slightly expanded and not appearing annular.

Material examined: SOUTH AFRICA: **KwaZulu-Natal**: 1♂1♀ (2 unsexed, in alcohol), #28, Krantzkloof Nat. Res., 29°46'S:30°50'E, 5.v.1992, A. E. Whittington, *Combretum* River forest, 400 m (NMSA); 4♂14♀ paratypes, Jackson's Falls, Mhlatuzana River, 29°48'S:30°45'E, 18.xii.1990, 6.i.1991, Barraclough, Indig. Forest, 500 m (NMSA); 3♂3♀ paratypes, same data but: A. E. Whittington, 500 m, Reared out: 18.i.1991, from Hyrax Faeces (NMSA); 2♂, Jackson's Falls, Mhlatuzana River area, 29°48'S:30°45'E, 26.i.1996, D. A. Barraclough, Indig. Forest, 500 m



37



38

Figs 37–38. Photographs of female postabdominal structures in *Afrocamilla stuckenbergi* Barraclough, 1992, from Krantzkloof Nature Reserve, KwaZulu-Natal. 37. Ventral receptacle, showing weakly scelerotised distal extension, and broader, strongly sclerotised, basal section. 38. Sclerotised sections of two spermathecal ducts (at left), and greatly reduced, sclerotised spermathecae (top right).

(NMSA); 1♂ paratype, Pietermaritzburg, Town Bush, 29.x.1971, M. E. Irwin (NMSA); 2♀ paratypes, Pietermaritzburg, Town Bush, viii.1976, R. Miller (NMSA); 5♂1♀, #45, Royal Natal Nat. Park, 28°41'S:28°57'E, 3.ix.1992, Barraclough Whittington, rock scree at Main Office Area, 1400 m (NMSA).

Discussion: *Afrocamilla stuckenbergi* is known only from KwaZulu-Natal, where it is recorded from four localities. Three of these localities are in the coastal belt and the midlands and are typically indigenous forest areas (Krantzkloof Nature Reserve, Jackson's Falls, Pietermaritzburg (Town Bush)). The fourth locality is a montane (disturbed, albeit partially wooded) roadside area in the Drakensberg (Royal Natal National Park). *A. stuckenbergi* occurs sympatrically with *armata* at Royal Natal National Park (rock scree) and at Jackson's Falls, although only one female of *armata* has ever been collected at the latter locality, and males are needed to confirm this record. At three localities (Pietermaritzburg (Town Bush) excepted), specimens of *stuckenbergi* were collected from hyrax excrement.

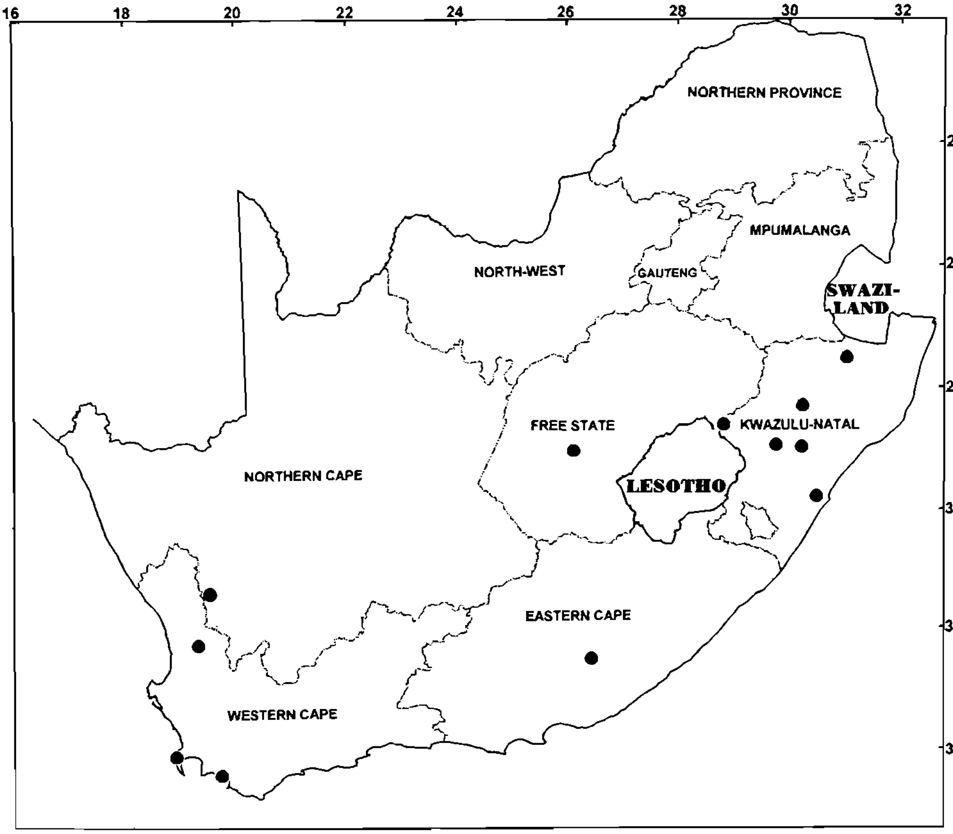


Fig. 39. Distribution of *Afrocamilla armata* (Hackman, 1960) in five provinces of South Africa, inclusive of material listed as 'Further material seen'.

Afrocamilla stuckenbergi is similar to both *A. armata* and *A. elongata*, but is readily distinguished from both by the much more robust epandrium which is markedly deeper in profile at its posterior extremity (Fig. 33). It is also distinguished from *armata* and *elongata* by the profile shapes of the postgonite and the epiphallus. In *stuckenbergi* the postgonite is triangular in profile (broad basally and sharply pointed apically (Fig. 33)), but laterally directed and slender apically in *elongata* (Fig. 28), and broadly rounded apically (not narrowed) in *armata* (e.g. Figs 21, 23 &

25). With respect to the epiphallus, this structure is broad along much of its length but relatively sharply pointed apically with a backwardly directed hook-like projection in *stuckenbergi* (Fig. 33), whereas it is elongate, very slender and sharply pointed apically in *elongata* (Fig. 28), and robust but very broadly rounded apically in *armata* (e.g. Figs 19, 21 & 25). The only other species in the *armata*-complex is *A. adusta* (Tanzania), which is strongly distinguished by the much shallower epandrium and the unusually short and slender surstylus (see Barraclough 1997: Fig. 10).

Undescribed sp. A

Material examined: SOUTH AFRICA: **KwaZulu-Natal**: 1♀, #21, Itala Game Reserve, 27°31'S:31°14'E, 27–29.iii.1996, D. A. Barraclough, Woodland/Thornveld, 800 m (NMSA).

Discussion: This single female closely resembles *armata*, although the latter species has not yet been definitely recorded from this locality. I have excluded the specimen from *armata* because of its unusually shallow cheek profile, which is just less than 0.2 X the length of the third antennal segment (range is 0.3–0.8 X in *armata*). I suspect that the specimen may represent a new species, but additional material (including the male) must be collected before any decisions can be made.

Undescribed sp. B

Material examined: SOUTH AFRICA: **KwaZulu-Natal**: 1♀, #13, Royal Natal Nat. Park, 28°44'S:28°56'E, 1.iv.1993, J. G. H. Londt, Gorge area/forest, 1600 m (NMSA).

Discussion: This single female appears to have close affinity with *A. sineseta*, although it differs in having the entire humeral area and the anterior half of the mesonotum completely orange-brown. The specimen is in fairly poor condition as the left wing is missing and the mesonotum is mostly rubbed. An identification must await additional material, including males, from the locality.

ACKNOWLEDGEMENTS

I am indebted to a substantial number of colleagues who have shared my enthusiasm for collecting camillid material in South Africa. In many instances these individuals have assisted with the collection of material, made observations or have taken photographs; for this I would particularly like to thank Dr B. Stuckenberg (Director *emeritus*, Natal Museum), Dr J. Londt (Director, Natal Museum), Mr A. Whittington (formerly of the Entomology Department, Natal Museum), Dr R. Miller (Department of Zoology & Entomology, University of Natal) and Dr J. Manning (National Botanical Institute, Kirstenbosch). I am also grateful to the Lund University Museum for the extended loan of the holotype of *Afrocamilla armata*. My Scientific Technician, Ms S. James, is to be thanked for assistance with the collection of material at Mpofu Game Reserve, and for the skilful execution of all the artwork. Mr J. Williamson (Manager, Mpofu Game Reserve) is acknowledged for leading me to the hyrax abode at the reserve, and later for taking photographs of the locality. Dr M. Kotrba (Entomology Department, Smithsonian Institution) kindly assisted with

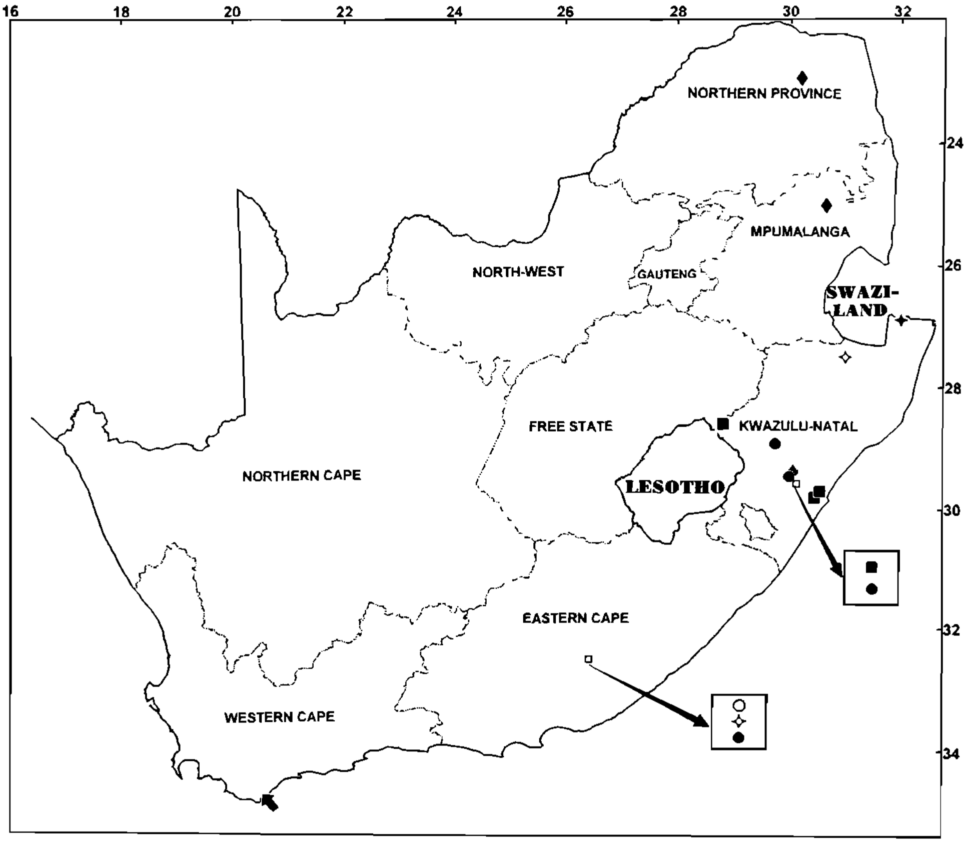


Fig. 40. Distribution of six *Afrocamilla* species in South Africa; sympatric distributions for point localities are shown in squares to the right of the map for Mpofu Game Reserve (Eastern Cape) and Pietermaritzburg (KwaZulu-Natal). *Afrocamilla artopenna* sp. n. = ✦; *A. carolae* sp. n. = ○; *A. confusa* sp. n. = ✧; *A. elongata* sp. n. = ●; *A. sineseta* sp. n. = ♦; *A. stuckenbergi* Barraclough, 1992 = ■. An undetermined species was observed (but not collected) at De Hoop Nature Reserve in the Western Cape (arrowed).

the preparation of slide-mounted material of the ventral receptacle and spermathecae of *A. stuckenbergi* (Figs 38 & 39), during her visit to the Natal Museum in 1992. Ms V. Ward (Research Technician, Natal Museum) assisted with darkroom work. A debt of gratitude is owed to Drs Londt and Stuckenberg, for kindly refereeing a draft of this paper. Finally, the Foundation for Research Development (FRD) is thanked for financial assistance during the tenure of this project, which made many of the field trips possible.

REFERENCES

BARRACLOUGH, D. A. 1992. *Afrocamilla stuckenbergi*, a new African genus and species of Camillidae (Diptera), with comments on its behaviour and biology. *Annals of the Natal Museum* **33** (1): 37–49.

——— 1993. *Teratocamilla*, a new genus of Camillidae (Diptera) and two new species of *Camilla*, from southern Africa. *Annals of the Natal Museum* **34** (1): 19–30.

——— 1994. *Hemeromyia australis* sp. n. and *Meoneura prima* (Becker, 1903) from Namibia and

South Africa, the first Carnidae (Diptera: Schizophora) recorded from subequatorial Africa **35**: 15–24.

——— 1997. New East and West African species of *Afrocamilla* Barraclough (Diptera: Schizophora: Camillidae). *African Entomology* **5** (2): 181–193.

BARRACLOUGH, D. A. & WHEELER, T. 1995. Three new species of Camillidae (Diptera) from the southwestern Nearctic Region, the first species of the family described from the New World. *Proceedings of the Entomological Society of Washington* **97** (4): 737–745.

COGAN, B. H. 1980. Family Camillidae. *In*: Crosskey, R. W., ed., *Catalogue of the Diptera of the Afrotropical Region.* London: British Museum (Natural History) p. 654.

DAVIES, R. 1997. Family Procaviidae (part). *In*: Mills, G. & Hes, L., comps., *The complete book of southern African mammals.* Cape Town: Struik Winchester p. 228.

DEEMING, J. 1997. The first endemic species of *Meoneura* Rondani (Diptera: Carnidae) to South Africa. *Annals of the Natal Museum* **38**: 133–136.

HACKMAN, W. 1960. Diptera (Brachycera): Camillidae, Curtonotidae and Drosophilidae. *In*: Hanström, B. *et al.*, eds., *South African Animal Life*, Vol. 7. Göteberg: Almqvist and Wiksell pp. 381–389.

PAPP, L. 1985. A key of the world species of Camillidae (Diptera). *Acta Zoologica Hungarica* **31**: 217–227.

PRINGLE, J. A. 1975. The distribution of mammals in Natal. Part 1. Primates, Hyracoidea, Lagomorpha (except Lepus), Pholidota and Tubulidentata. *Annals of the Natal Museum* **22** (1): 173–186.

SMITHERS, R. H. N. 1983. Order Hyracoidea. Dassies XXXVIII Family Procaviidae. *In*: *The mammals of the southern African subregion.* Pretoria: University of Pretoria pp. 541–552.

WIRTH, W. W. & TSACAS, L. 1980. Family Curtonotidae. *In*: Crosskey, R. W., ed., *Catalogue of the Diptera of the Afrtropical Region.* London: British Museum (Natural History) pp. 671–672.

Date received: 1 August 1997